RAILWAY Mechanical and Electrical Engineer

SEPTEMBER, 19

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SEPTEMBER, 1950

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RAILWAY Mechanical and Electrical Engineer

Car and Locomotive Practices In Transition

For some time the railroads have been passing through a period of transition with respect to locomotive maintenance. In the case of passenger cars, a major problem is the extreme cost of too much tailoring in the construction of new passenger-train cars. In most respects freight cars meet higher standards of quality so far as the reliability of the service they can render is concerned than ever before. One of the reasons for this is the improvement in the standards of equipment and practices in railroad wheel shops which is resulting from the impact of the Wheel and Axle Manual of the Mechanical Division. Another problem on which millions of words have been written and on which much work has been done is still a matter of concern and a source of periodic headaches. That is the hot box.

This month a group of associations, the members of which are directly responsible for the administration and supervision of repairing, servicing and operating motive power and rolling stock, and some of whom share in the responsibility for its selection, are all holding their annual meetings at Chicago. It is an appropriate time to direct special attention to the present status of, and outlook with respect to, motive-power maintenance and passenger-car standardization, to describe an outstanding wheel shop, and to add a few hundred more words to the millions which have already been written on the subject of hot boxes, directed particularly toward freight cars. The article in question approaches the problem from an unusually broad basis of fact, soundly interpreted.

When Diesel-electric locomotives were introduced in railroad service, relatively little thought was given to the problems of servicing and maintenance, which were bound to increase in importance as the number of such locomotives increased. While a few locomotives could be cared for with almost no special facilities, the demand for facilities adapted to the Diesel-electric locomotive became just as imperative for a fleet of these locomotives as that for the customary shops and engine terminals ministering to steam locomotives. A few railroads are now operating almost exclusively with Diesel locomotives and others have acquired substantial fleets. They have now been dealing with the problems of servicing and repairing Diesels long enough so that the nature and extent of the facilities required and the character of the methods to be employed are becoming evident. The Locomotive Maintenance Officers' Association and the Electrical Section of the Mechanical Division are dealing both with facilities and practices. The kind and scope of facilities being found necessary are the theme of articles in this issue.

The associations have recognized the need of closer coordination between the mechanical and electrical departments by joint meetings of the Coordinated Mechanical Associations and the Electrical Sections of A.A.R. The two Electrical Sections, respectively representing the Engineering and Mechanical Divisions of the A.A.R., have in turn indicated their perception of the circumstance by holding joint, rather than consecutive, meetings.

The Diesel-electric locomotive and the modern passenger car are primarily responsible for this need of coordination. Although Diesels have been in service on American roads for 25 years, they are still "foreigners" to many railroad men. This may be because many railroad maintainers have no electrical background; it may be because they do not appreciate the importance of precision maintenance, and it may be that the operating man does not recognize the combination of capacity and limitations inherent in this type of motive power.

Concerning passenger cars, one mechanical officer said "The modern passenger car is a fearful and wonderful thing." Another said "If I could have my way, I would have one steam pipe down each side of the car for heating, with oil lanterns hanging over the center aisle for light." In the same breath he apologized for being such a reactionary, but the statement left no doubt that his maintenance problems were giving him some trouble.

Also in recognition of this circumstance, the Railway Mechanical Engineer changed its name to the Railway Mechanical and Electrical Engineer. The amount of electrical information in its feature articles has been increased and the Electrical Section is larger than in previous years. It is the opinion of this paper that the two departments must work still more closely together. They cannot stand successfully alone.

New N. Y. C. Wheel Shop at Beech Grove

Additions and improvements increase both the productive and storage capacity and assure output to meet present needs

The New York Central has recently completed an addition to the Beech Grove, Ind. wheel shop, and has revised the layout both inside and outside the shop. The addition comprises an 81-ft. extension of brick and glass block construction to the original shop building and the installation of an extensive overhead monorail and traveling beam crane system. Changes in the area external to the shop consisted of installing an elevated wheel disposal runway and revising the locations of the storage areas for the different types of wheels and wheel sets. Completion of the revisions has resulted in more efficient material handling and maintenance, particularly with respect to roller bearing repairs, and has provided space for installing new high-production machinery.

The general arrangement of the layout is shown in Fig. 1. The mounted wheel sets awaiting repair are unloaded at the west end of the shop in the area north of Track 1. The different kinds of wheel sets are stored at various locations north of Track 1, and on Tracks 3 and 4 south of Track 2, at the west end of the shop as shown by Tables I and II. The storage capacity is 454 wheel sets north of Track 2 and 82 sets south of Track 2. New unmounted wheels are stored in an area north of the mounted wheels, which has a capacity of 1,250 wheels. Wheel sets ready for service are held until ready for shipment or application on Tracks 2 through Track 21 west of the shop. The storage capacity here is 489 wheel sets as listed in Table III. Axles from which the wheels have been demounted are stored on racks north of the western half of the shop. The axles are segregated according to size and whether scrap or O. K. second hand as shown in Table IV. The total capacity of the axle storage area is 600 O.K. axles and 75 scrap axles.

The present shop comprises the original wheel shop 122 ft. long by 79 ft. wide and the 81-ft. extension on the west end. The extension, or new part of the shop, is used almost entirely for roller bearing work; it does contain, however, a 50-in. wheel lathe in the southeast corner, a conventional axle lathe along the north wall, and two demounting presses located along the west wall. One of the demounting presses is located adjacent to both Track 1, the inbound track for friction-bearing wheel sets to be demounted, and to the entrance to the wheel disposal runway. The machinery installed in the new shop is listed in Table V, that in the old section in Table VI. A tool room is located in the balcony above the office for grinding carbide and high-speed steel tools.

The entire shop is equipped with an extensive overhead material handling system. Most of the new section is served by a traveling beam with two hoists of 5,000-lb. capacity. It has a span of 40 ft. and extends from the north wall to the south wall. A monorail section 20 ft. long extends the range of the hoist from the eastern extremity of the span to the modified driving wheel press in the southwest corner. Junctions can be made between the traveling beam and the monorail in this and all other monorail extensions so that the hoist can pass freely from the traveling beam to the fixed monorail section.

A second monorail section extends the range of the hoist at the northwest corner of the shop. This section extends west for about 14 ft. and then turns 90 deg. to exit through the north wall, from which point it runs parallel to the wall. It makes a 90-deg. turn south and enters the shop near the center. This monorail section is used to transport axles to storage, and to move them from storage to either the cleaning machine or to one of the axle lathes.

The north half of the old section is served by a traveling crane with two beams. The west beam has a 4,000-lb. hoist and the east beam has a 2,000-lb. hoist. The beams have a span of 22 ft. The crane system in the old section of the shop is connected to that in the new section by a fixed monorail section. Thus, either hoist from either of the two traveling cranes can move from nearly any point in the shop to nearly any other point.

Lift truck transportation is also used extensively throughout the shop because of the savings realized. Surplus and scrap axles can be handled for about half the cost of hand truck movement. New and second hand axles cost about one-fifth as much to move into the shop by lift truck. A saving of 60 per cent is realized on handling mounted friction bearing wheel sets to the machine shop. Roller bearing wheel sets, and gear-drive generator wheel sets, are handled for about one quarter the cost of hand movement.

TABLE I—STORAGE OF REPAIRED MOUNTED WHEELS AT WEST END OF WHEEL SHOP SOUTH OF TRACK NO. 1

Kind	Size, In.	Identification letter	Storage Capacity
Locomotive roller bearing and baggage	36	G	18*
6-in. by 11-in. roller bearing and Spicer drive	36	H	8
6-in. by 11-in.	36	J	7
5½-in. by 10-in. roller bearing and Spicer drive	36	K	7
5½-in. by 10-in. roller bearing	36	L	7
5½-in. by 10-in. Mercury† Spicer drive	33	M	7
5½-in. by 10-in. Mercury†	33	N	7
5½-in. by 10-in. friction Spicer drive	36	P	7
Miscellaneous	..	R	14
Total	..	..	82

* Awaiting repair.
† For "Mercury" trains which use 33-in. wheels.

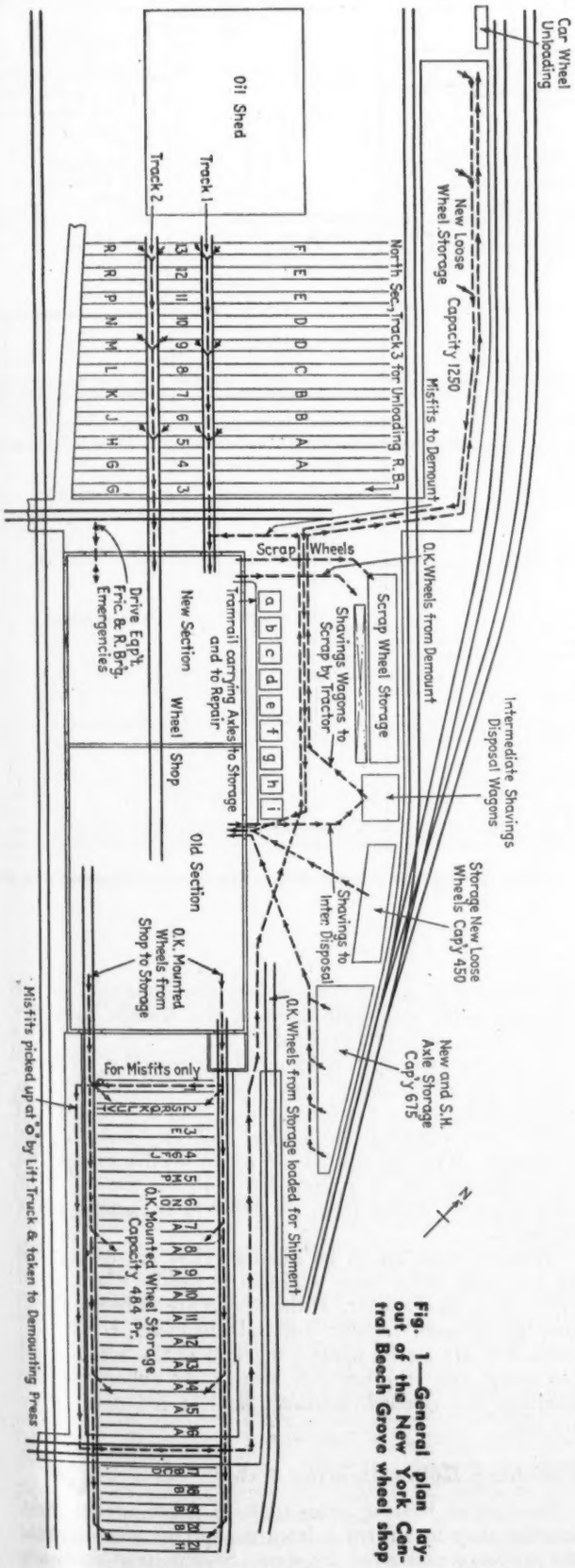


Fig. 1—General plan layout of the New York Central Beech Grove wheel shop

TABLE II—STORAGE OF MOUNTED WHEELS AWAITING REPAIRS AT WEST END OF WHEEL SHOP NORTH OF TRACK NO. 1

Kind	Size, In.	Identification letter	Storage capacity
Scrap wheel	33	A	84
Rough journal	33	B	84
Tread turning	33	C	42
Scrap wheel	36	D	84
Rough journal	36	E	84
Tread turning	36	F	42
Total	..	..	420

TABLE III—O.K. MOUNTED WHEEL STORAGE AT WEST END OF SHOP

Type of mounted wheels	Identification letter	Storage capacity
33-in. cast iron, in.		
4¼ by 8	C	9
5 by 9	B	91
5½ by 10	A	260
6 by 11	D	1
Last wear steel, in.		
5 by 9	S	3
5½ by 10	R	3
6 by 11	Q	2
36-in. multiple-wear steel, in.:		
5 by 9	F	8
5½ by 10	E	20
6 by 11	G	5
33-in. multiple-wear steel, in.:		
5 by 9	K	1
5½ by 10	J	7
6 by 11	H	23
6½ by 12	L	1
One-wear steel, in.:		
4¼ by 8	P	2
5 by 9	N	17
5½ by 10	M	23
6 by 11	O	8
Davis cast steel, in.:		
5 by 9	U	1
5½ by 10	T	3
6 by 11	V	1
Total	..	489

TABLE IV—AXLE STORAGE IN THE OUTDOOR RACKS ALONG THE NORTH SIDE OF THE SHOP

Symbol	Size, in.	Capacity
a	6 by 11	75
b	5½ by 10	75
c	5½ by 10	75
d	5½ by 10	75
e	5½ by 10	75
f	5 by 9	75
g	5 by 9	75
h	4¼ by 8	75
i	Scrap axles	75
Total	.....	675

TABLE V—PRINCIPAL MACHINERY IN THE NEW SHOP SECTION

Chambersburg 600-ton duplex wheel press for demounting scrap friction wheels
20-in. American duplicating lathe to turn roller bearing axles
Niles center-drive axle lathe to turn friction bearing axles
Landis hydraulic grinder 16 in. by 96 in. to grind roller bearing axles
Sellers 50-in. car-wheel lathe for tread turning
Chambersburg 600-ton modified drive wheel press for roller bearing wheel set demounting

TABLE VI—PRINCIPAL MACHINERY IN THE OLD SHOP SECTION

Two Niles axle lathes for friction-bearing axles
Niles 400-ton mounting press
Niles boring mill for cast-iron wheels
Niles hydraulic boring mill for steel wheels
Niles journal turning lathe
Betts-Bridgeford journal turning lathe
Magnaflux machine, Type XXR
Flame-wire brush mechanical axle-cleaning machine

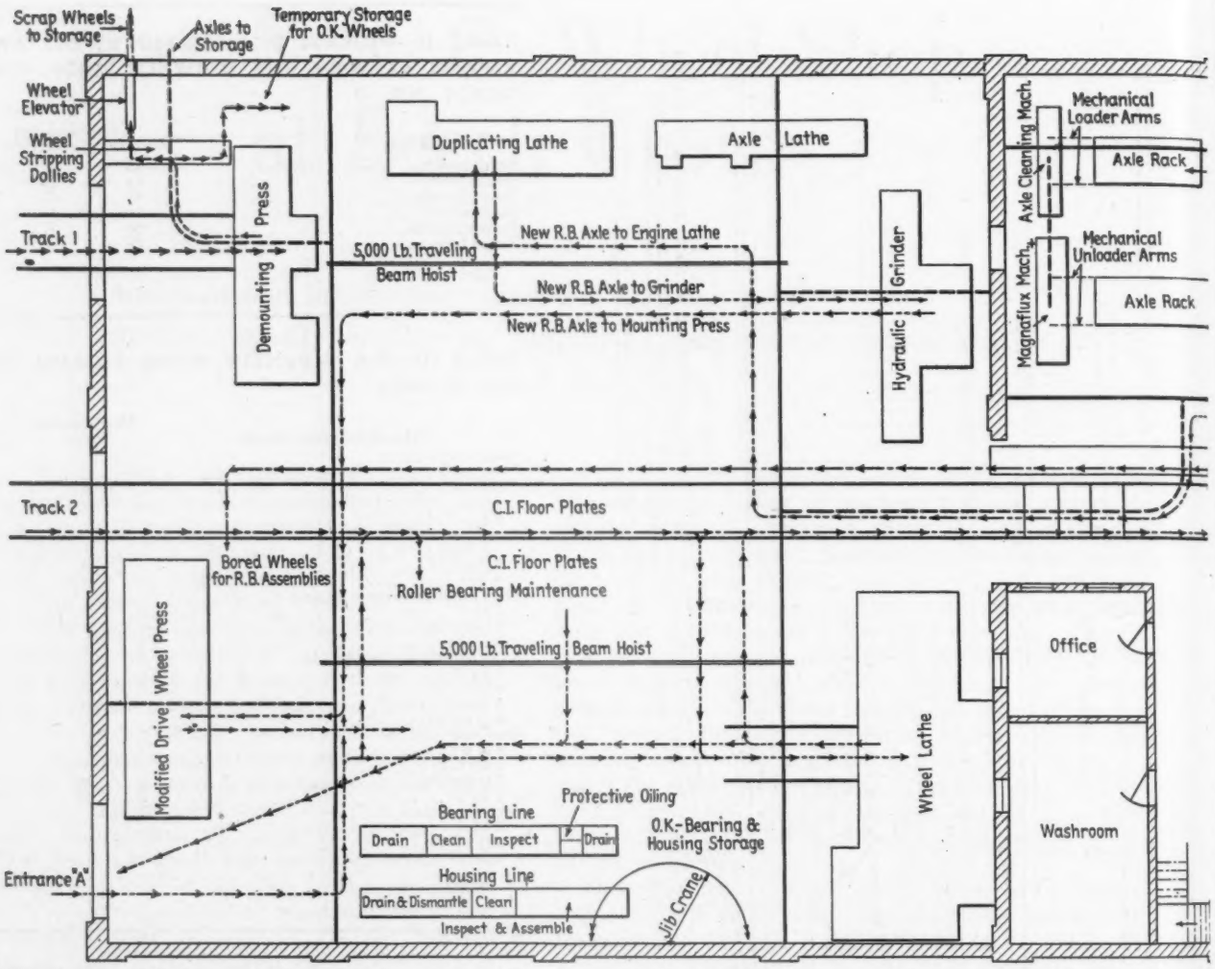


Fig. 2—Interior of the Beech Grove shop showing the flow

Track 1 on the west end of the shop is used for rolling in friction units to be demounted. Friction bearing wheel sets requiring journal truing, friction or roller bearing sets requiring tread turning and roller bearing units requiring bearing maintenance enter on Track 2. Through entrance "A" pass all wheel sets with geared generator drive which require demounting or tread turning, also roller bearing drive sets requiring bearing maintenance or drive maintenance; movement is by lift truck and traveling crane.

Roller Bearing Maintenance

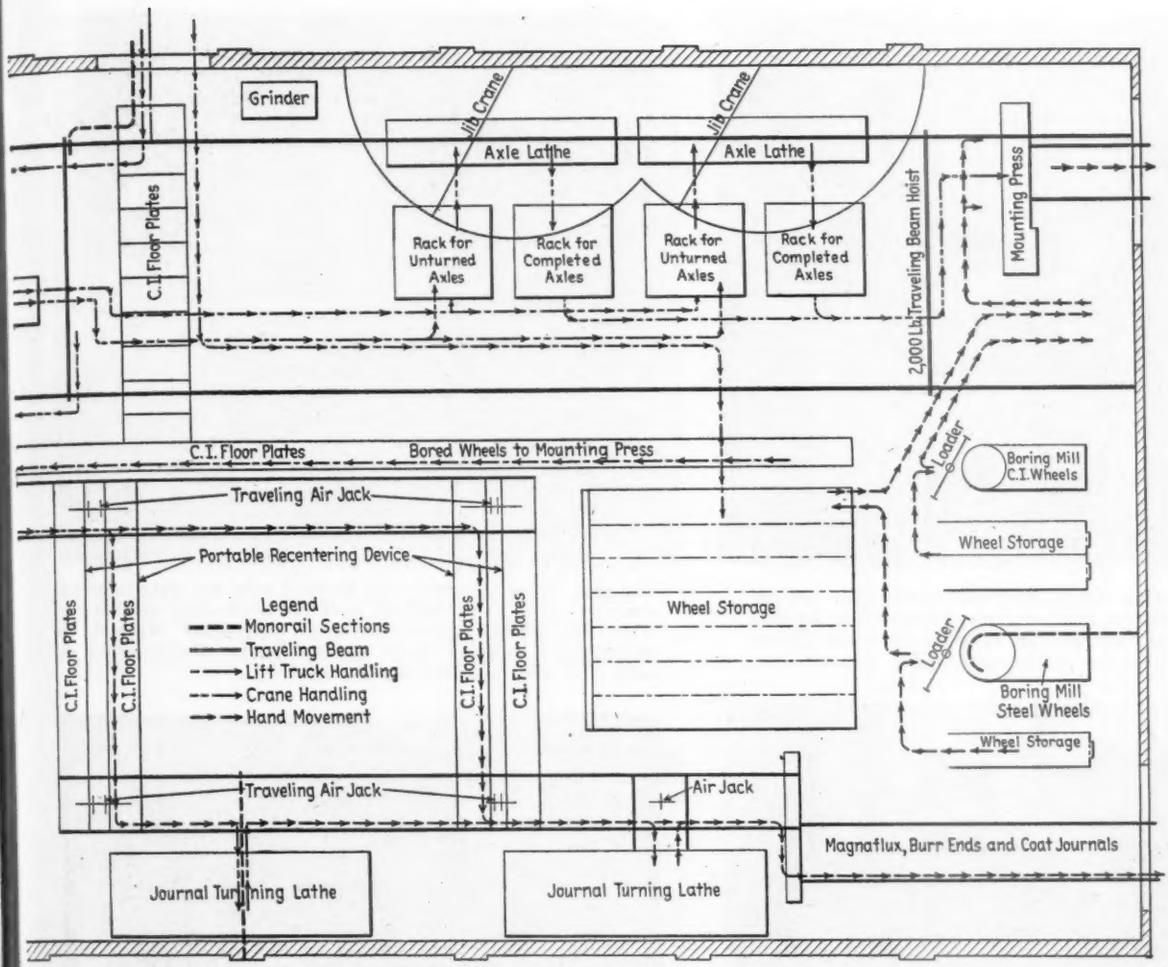
Roller bearing wheel sets are handled by lift truck into the shop on Track 2 from the area south of Track 1 on the west end of the shop. Stripping is done adjacent to a pair of tables on which the roller bearing parts will later be cleaned. During removal of the boxes, a special pan is slipped under the bearing to catch the oil that drips from the bearing. The housings are carried to the cleaning table nearest the south wall by a crane with a special hook and placed upon rollers for draining dismantling. They are cleaned in a vat which contains a mechanically agitated solution and is integral with the cleaning table. After cleaning, the housings are placed on a second set of rollers on the opposite side of the cleaning vat for draining, inspection and assembly. A jib crane with a 7-ft. radius lifts the housings off the cleaning table and puts them in the storage area for usable housings and bearings.

A similar procedure is followed for cleaning the bearings on the second table. This table has rollers for draining the bearings, a vat for cleaning, and a second set of rollers for draining, inspecting and any conditioning necessary. It also has provision for protective oiling, and an additional set of rollers for draining the oil. The bearings are carried from the table to the storage area by hand.

Where wheels are to be removed they are demounted on a driving wheel press modified to handle wheels from 33 to 41 in. in diameter. If the wheels are to be scrapped, they go through regular disposal channels. If satisfactory, they are stored against the wall of the scrap wheel bin along with all other O.K. wheels. In either case, the bearings are cleaned, inspected and stored until ready for use.

Finishing Roller Bearing Axles

New roller bearing axles to be finished are brought into the shop by lift truck from the storage area opposite the northeast corner of the shop. Second-hand axles are brought into the shop on the monorail-and-traveling-beam crane system from the storage racks along the western



of materials and the methods of handling (See legend)

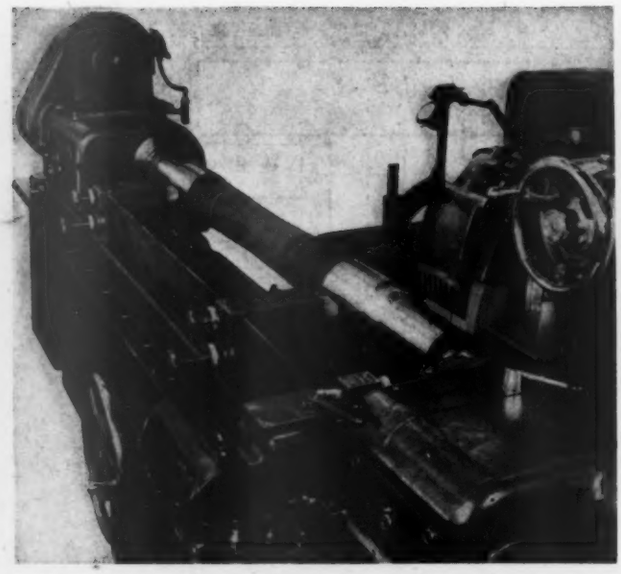
half of the north wall of the shop. In either case, they are loaded on the American Pacemaker duplicating lathe by a crane from the traveling beam hoist.

The new axles are turned all over with carbide tools on the duplicating lathe at a speed of 238 r.p.m. and a feed of .150 in., except at the radii where the feed is reduced to .075 in. After being finished to about .015 in. over blueprint dimensions, the axle is transferred by the overhead crane to the Landis hydraulic grinder. This machine grinds the bearing and bearing radius, and the dust guard seat and its radius. Grinding is done at 550 r.p.m. on the 30-in. wheel, and a low feed used to get the best possible finish. The grinder has a hydraulically operated wheel feed mechanism, and electric rapid traverse, a profile wheel-truing fixture mounted on the footstock and profile bars mounted on the bed of the machine.

The completed axle is moved via the overhead crane system to the modified drive wheel press for wheels and bearings. The wheels, either new or second hand, are brought into the shop from one of the two storage areas north of the shop and are carried by lift truck to the wheel storage area at the east end of the shop. This holds seven rows of 36 wheels each. In the morning it is a pre-boring storage area, but as the day continues it becomes more and more a storage area for finished wheels. There is also a small wheel storage area immediately south of the boring mill. The wheels are rolled by hand in both directions between either storage area and the boring mill. They are bored on the southernmost mill, a new Niles 48-in. hydraulic boring mill. It is loaded and unloaded with a duplex loader when handling wheels up to 36-in. diameter; for wheels above this size, such as locomotive engine truck and trailer truck wheels, a side-arm loader is also installed with the borer.

The bored wheels are transported from the storage area to the modified drive wheel press either by a lift truck or by a Needham wheel carrier. An east-west pathway of cast iron plates down the center of the shop is installed to facilitate the latter movement. The plates are installed between the rails of Track 2 from the west end to an area opposite the Magnaflux machine. From here the plate path is just north of the track and narrows to 2½ ft.

The mounted wheel sets are rolled by hand to the roller bearing maintenance area for application of covers and boxes, greasing, etc. The finished wheel set is rolled by hand to the Sellers 50-in. wheel lathe for tread turning. The tread turning completes all work on the roller bearing sets; they are carried by lift truck out through a door at the south corner of the west wall to storage areas G through R west of the shop, and stored according to type as shown by Table 1.



Bearing and bearing radius, and dust guard seat and its radius are ground on roller-bearing axles with a Landis Type FF plain hydraulic grinding machine 16 in. by 96 in.

The type of loader which will be used with the axle-cleaning machine shown here installed with the Magnaflux machine—With the present arrangement the Magnaflux machine is loaded by a monorail hoist and the loader shown above is used with the axle-cleaning machine

Removing an axle from the Magnaflux machine with the pneumatic unloader

A roller-bearing cleaning table, with an integral tank in which cleaning solution is mechanically agitated—Assembly rack for Spicer-drive units is shown at the left

The wheel lathe has a recess in the face plate 26 in. square to accommodate roller bearing assemblies, and this permits turning on centers, which is normally used for reconditioning both roller and friction bearing assemblies. A filler block is used for collet driving. It is installed only when added rigidity is required, or perhaps in cases where a long straight run of friction bearing sets are to be handled.

Handling Geared Generator Drives

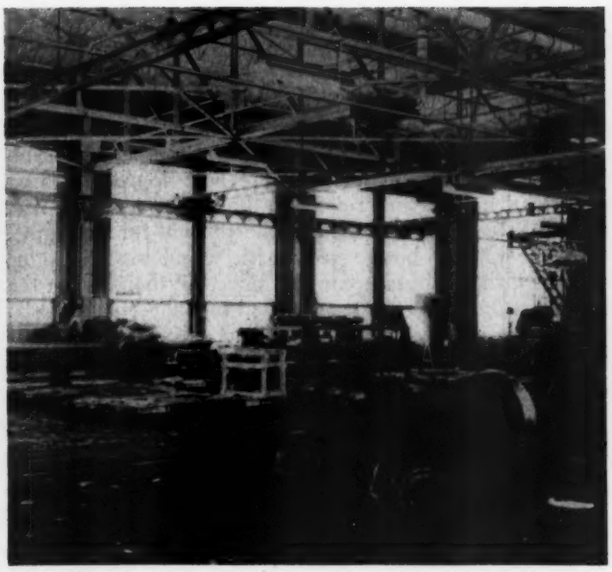
The press at the west end of the shop for mounting and demounting the roller bearing wheel sets is a modification of a Chambersburg 600-ton, 90-in. driving wheel press. It is depressed 36 in. into the floor so that the axles will be centered during pressing operations, and it will handle wheels from 33 to 41 in. in diameter.

The center section of the resistance beam was enlarged to form an opening 23 in. high and 21 in. deep. This permits handling Spicer and General Electric gear drive generator units. The entire contact surfaces on each end were reinforced with 2-in. plate. The rear was reinforced with three 1½-in. gussets. To move the resistance beam from mounting to demounting position, an air motor attachment has been applied. The air motor drives the wheels that ride on the tie beam through a vertical shaft, connecting to one pair of the wheels. A special hook was forged for use with this single-end press to prevent a loose wheel dropping off when turning the wheel set.

A special rack has been built to hold geared-drive electric generator units at a convenient working height for assembling and disassembling. The geared sets are handled in this shop only when the units are removed. When nothing further than journal turning is required, the sets are sent to the locomotive shop for the work.

Axles Cleaned Mechanically

The cleaning, loading and unloading, and transferring of all axles, both roller and solid bearing, for Magnaflux



The American duplicating lathe and the Landis grinder, the combination of which finishes roller-bearing axles—A portion of the overhead crane system that serves the roller-bearing section of the shop is shown overhead

The old section of the shop showing the monorail section which connects the traveling beam hoists in this section with those in the new section—In the lower foreground is the new shop flooring and cast-iron-plate sections under construction

The modified driving-wheel press with enlarged resistance beam center section to handle gear-drive generator units

The wheel lathe has a recessed face plate to permit turning roller-bearing assemblies on centers

inspection is done with mechanical aid. The axles are loaded on the cleaning machine by a device that is a combination storage rack and power loader. Up to 15 axles are stored on a rack which inclines slightly toward a pair of arms which are normally elevated to an angle of about 30 deg. When it is desired to place an axle on the cleaning machine rollers, the ends of the arms away from the storage rack are lowered by pivoting them about the storage-rack end. This lowers the free end of the loader below the pivot end, and causes the axle to roll toward the end until it comes against a pair of stops, one on each arm. Continuing to lower the arms rests the axle on the rollers of the cleaning machine. Power for this is supplied by an electric motor.

The axles are cleaned by a revolving wire brush with provision for flame cleaning when necessary. The axle is revolved by driving one pair of the rollers with an electric motor, while the wire brush, also motor driven, rests on the axle through a pivoted arm. It thus rests by its own weight and follows the contour of the axle automatically.

Upon completion of the cleaning operation, the axles are transferred to the Magnaflux machine by a ½-ton trolley which runs on a fixed I-beam with a 24-ft. span. When the axle has been inspected, it is transferred by a pneumatic lift to a storage rack which holds 20 axles. The lifting mechanism is actuated by a single-acting air cylinder 8 in. by 3 ft., which is free to move in a vertical arc at the lifter end and is pivot-mounted on the fixed end. The lifter end of the cylinder actuates a pair of arms which move along a 30-deg. path on two pairs of rollers. The arms are guided by a third pair of rollers mounted to contact the top surfaces of the arms and restrain the arms to the 30-deg. path.

The axle is removed from the Magnaflux machine by admitting air to the cylinder which raises the lifting arms.

A pair of stops on the arms contact the axle immediately before the end of the stroke and raise the axle clear of the rollers of the machine. Bleeding the air from the cylinder allows the arms to descend along the 30-deg. guides. As the stops clear the top of the rack on the descent, the axle rolls clear of the lifter on to the rack for storage. Movement from this point for mounting or for turning is by lift truck.

Friction bearing axles to be turned are moved to either one of two storage racks located a short distance east of the inspection area. From each rack the axles are loaded on to the axle lathe served by that rack. Loading is by a 14-ft. jib crane with a ½-ton hoist. The same crane unloads the axle after turning, and places it in the storage rack for completed axles. Each of the four axle racks, two for storing axles to be turned and two for completed axles, holds 38 axles. Completed axles are moved from the storage rack by the 2,000-lb. hoist on the traveling crane which spans the entire northeast corner of the shop.

Previously inspected second-hand axles brought into the shop from the storage area north of the west half of the north wall of the shop are also transported by lift truck and follow the same procedure as those inspected immediately prior to turning. While on the rack for completed axles, the wheel seats are measured by the boring mill operator for boring the wheels to fit.

Handling Friction Bearing Wheel Sets

All friction bearing wheel sets requiring journal turning except those with geared generator drives, are unloaded west of the shop. The wheel sets are then rolled through the shop on Track 2 and stored on one of the two north-south tracks just east of the center of the shop on the south side. These two tracks are used for storing wheel sets awaiting either of the two journal turning lathes along the south wall. Moving the heel sets to the lathes is done by turning them on air jacks and rolling them along the track in front of the two lathes. The sets are loaded on the Niles lathe, which is a floor installation, by a monorail hoist with a capacity of 4,000 lb. The second journal turning lathe is a Betts Bridgeford pit installation, and is loaded through a bridge track.

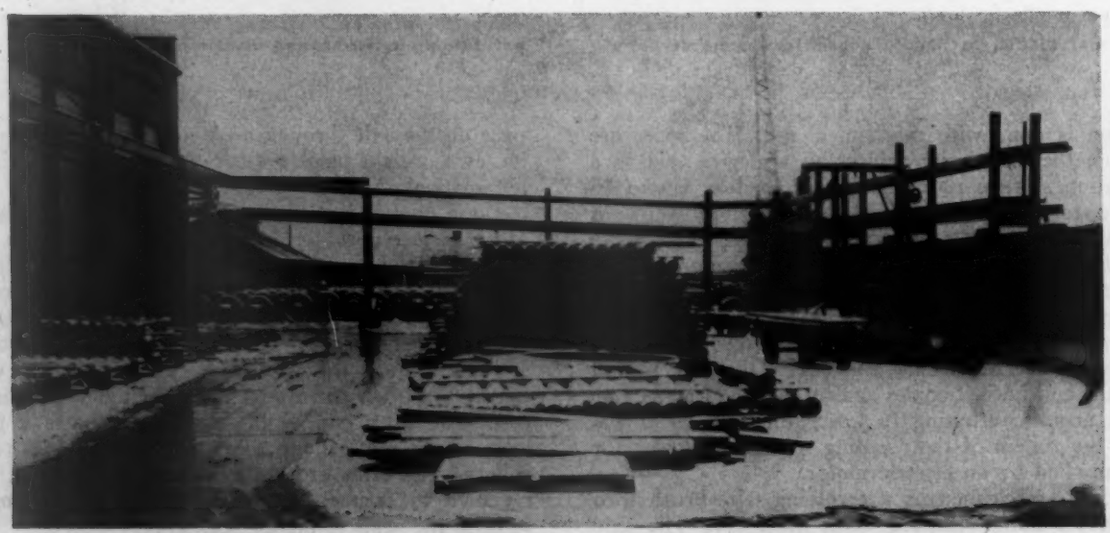
The layout of the storage and loading tracks for the journal turning lathes is such that either storage track can feed either machine. A clear track is also provided for rolling the completed wheel sets out of the shop to the storage area east of the shop.

Where the friction bearing wheel sets require tread turning, they are moved by lift truck or by rolling on Track 2 to the wheel lathe or to the coach shop depending on existing conditions. Where both journal turning and tread turning are required, the sets are moved first to the wheel lathe and then to the journal turning lathe.

Where one or both wheels of a wheel set are to be scrapped, the mounted pair are moved by hand from the storage tracks to Track 1 and rolled into shop on Track 1. Both wheels are removed simultaneously by the Chambersburg 600-ton demounting press in the northwest corner of the shop. Wheel sets can be moved from this press for further movement to any point in the shop when emergency through service is desirable. When wheels are demounted, one is rolled on the pneumatic elevator of the wheel disposal unit. The wheel is hoisted to the runway level about 12 ft. above the floor and runs by gravity to one of two scrap bins. One bin is for steel wheels and the other for cast iron wheels; selection of the bin into which the wheel will drop is made by an air-operated switch.

The second wheel removed from the axle, if it is to be scrapped, is rolled upon a small dolly and left there until the axle is moved clear of the area. The axle is moved out of the shop to the axle storage area north of the shop on the monorail with a 3,000-lb. hoist that serves the series of axle racks. The second wheel is then loaded on the wheel disposal runway to roll to the proper scrap bin. If one of the wheels removed from the axle is not to be scrapped, it is rolled by hand and to intermediate storage for movement by lift truck.

The completed axles and either new or O.K. second-hand wheels are mounted at the 400-ton Niles mounting press in the northeast corner of the shop. The mounted wheel sets are rolled out of the shop on a track that leads to the storage area east of the shop. The wheels are bored on either of two borning mills, one for steel and one for cast iron wheels. Each boring mill draws upon the large wheel storage area west of the machine, and there is a small storage area for wheels immediately south of each boring mill.



North side of the new shop section showing monorail that serves the axle-storage racks (left) and wheel-disposal runway and scrap wheel bin (right)

Passenger Cars Must Be Standardized*

Reasons why — Limitations defined — Present status of co-operative program of A.A.R. and A.R.C.I. — Extension of program in view

By Allen W. Clarke†

In discussing this subject with one of my mechanical friends, I found that the expression "standard passenger car" had an entirely different meaning for him than for me. To him it meant cars all exactly alike, with dull, uninteresting exteriors and interiors; with standardized air conditioning, heating equipment and other appurtenances providing doubtful comfort conditions either because of reasons of economy or because standardization had prevented the inclusion of latest improvements. This was, of course, entirely contrary to what I had in mind; standardized equipment must be the equal of the best in operation today in attractiveness to the traveling public and must never be so fixed as to preclude the introduction of improvements as they are developed and proved to be of value for increased passenger comfort or greater economy of operation.

Why Are Cars Not Ordered?

During the last year of World War II and the year, or year and a half, immediately following, a large number of passenger cars were ordered by the railroads. In 1945 orders were placed for 2,993 units, part of which, however, were troop cars, and 1946 orders were placed for 1,247 units. During 1949 a total of only 138 units were ordered, which is the smallest number for any year since 1942 when only 34 were ordered due to war restrictions. Why, then, did we have this about-face to the 1949 record of 138? Several possible answers to this question might be reviewed:

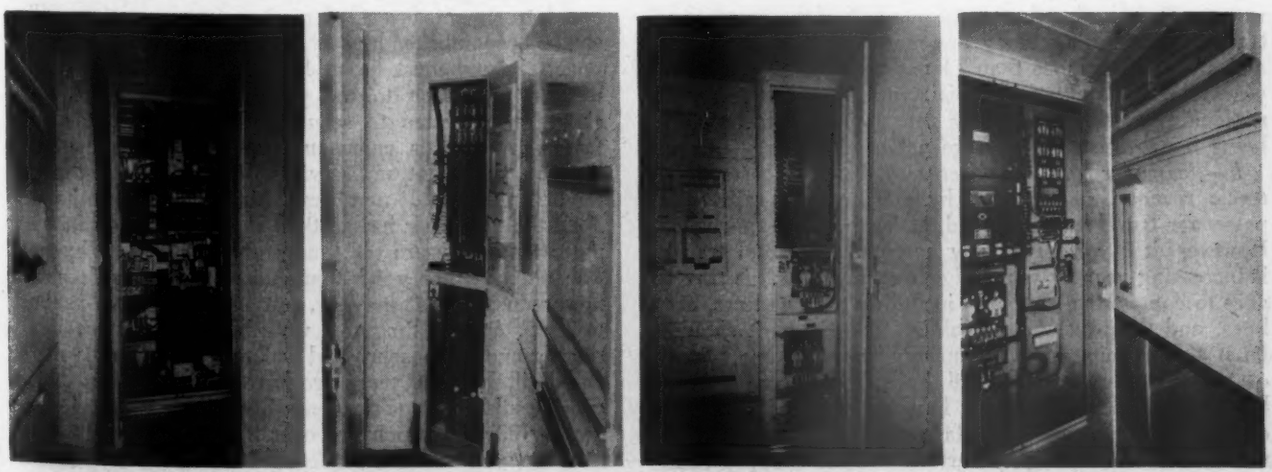
a—The railroads now have all the new modern passenger-train cars they need. The last complete records of Class I railway passenger-train-car ownership I have are as of January 1, 1949. The age distribution is shown in the table. The total number of cars delivered during 1949 was 970. Except for one of the war years when a large number of troop cars were produced, this the best record of any year since 1930. Yet 970 is less than 3 per cent of the total ownership and is hardly enough to make much of a change in the 1949 percentages, considering retirements and the fact that all cars are now one year

PASSENGER-TRAIN CARS OF CLASS I RAILWAYS AS OF JANUARY 1, 1949, CLASSIFIED BY AGES

Per cent	Age, years
40.99	Over 30
9.28	26 to 30
23.96	21 to 25
9.94	16 to 20
4.51	11 to 15
3.83	6 to 10
7.49	1 to 5
100.00	(Total no. 38,870)

* This article constitutes the major part of an address presented before the Pacific Railway Club on April 13, 1950.

† Chief engineer, passenger-car department, American Car & Foundry Co.



Electric lockers, if "located similarly in all cars and equipment installed in the same relation," reduce the difficulty of dealing with maintenance problems

Standard floor plans need not interfere with complete flexibility for seats, floor coverings, upholstery, paint and trim, and decorations

older. If a goodly number of the 15,931 cars over 30 years old were not retired, they certainly should have been. So we are safe in saying that about one half of the passenger-train cars operating today are more than 25 years old and only a little more than 11 per cent are less than 10 years old. Certainly, from this standpoint no one could reasonably contend that more new modern cars are not being bought because they are not needed.

b—Passenger travel has decreased. Based on passenger traffic revenue, as reported by most of the railroads, passenger travel has decreased, at least on the railroads. However, it is very generally accepted that total travel is increasing year by year. Of course, much of this travel goes to competitive agencies, including the bus lines, air lines, and the private automobiles. This is as it should be if the reasons are economically sound. Some forms of transportation are favored by subsidies and others by the use of taxes for the building and maintenance of highways, air ports, etc. Railroad passenger travel is, we are sure, considerably curtailed by the 15 per cent tax on rail and Pullman fares. Various means, including publicity by the railroads and by the American Railway Car Institute, and direct appeals to legislators by individuals and groups, are being used in an effort to secure equal treatment for all forms of transportation. What can be accomplished by such means is at the moment very uncertain and must be, at best, considered as a supplementary approach to the problem. Rather our efforts should be directed to securing for the railroads their fair share of this enormous passenger travel with the kind of equipment and services that will attract the customers in profitable numbers. This is going to be hard to do if the passenger has a 50-50 chance of riding in a car more than 25 years old. Some one will say "Why not? The old cars are good enough and just as safe as the newer ones." That may be, but 25 years takes us back to 1925. At that time cars were built without air-conditioning and the coaches had walkover seats. Some of the cars built 15 to 20 years ago have been modernized with good results, but such expense hardly seems justified for the 19,000 cars which are over 25 years old and which have certainly been overtaken by obsolescence and burdened with excessive maintenance costs. No, it does not appear that new modern passenger equipment buying

has been curtailed because total amount of travel by people generally has decreased.

c—The cost of new cars is too high. We must admit at once that this is certainly true. But we are not going to admit that it is the car builder's fault, nor are we going to say "That's just too bad. Materials cost so much, labor costs so much, the car builder should have at least a small profit to pay a dividenud for the use of the stockholders' money. Nothing can be done about it."

It may be that new equipment costs are not too high when it is considered that customers are drawn to the railroads by modern, comfortable, attractive new cars, whereas they are driven away by the old obsolescent equipment which has also become a cost burden from the standpoint of repairs. However, as previously admitted, costs are too high and should be brought down to the extent possible so as to permit the railroad to obtain some net return and to carry on a continuing program of equipment replacement.

How Reduce Costs?

We think the greatest possibility of reduction in cost of passenger-train cars lies in the direction of some measure of standardization. Over the years the A.A.R. has accomplished much in the standardization of freight cars and parts largely because of the necessities of interchange. This incentive, of course, does not apply so strongly for passenger-train cars, but is on the increase with "name" trains in many instances operating over several roads and also with the increasing railroad ownership and interchange of sleeping cars. It will probably be some time, however, before interchange forces standardization through A.A.R. rules and standards.

The lack of standardization in the passenger-car building program since the war has produced a nightmarish situation for the engineering and production personnel of the car builders that has been little short of appalling, and I speak from personal experience. The wide variety in interior arrangements, decorative schemes, specialties and the multitudinous variety of details involved in water systems, electric lighting, air conditioning and heating, kitchen arrangements, beds, seats, etc., has almost reached the point of absurdity.

Take our St. Charles plant for example. Since the war we have had 98 lots of passenger cars for a total of 460 units, or an average of 4.7 cars per lot; 18 lots with a total of 106 cars are still to be delivered. The largest lot was for 20 cars and there were 18 orders for one car only. Nineteen railroads are included in the list with 22 types according to standard A.A.R. classifications. Included in this program were eight major types of framing construction with numerous minor variations of each of these:

1—Carbon steel with welded frame and riveted sheets.
2—Low-alloy high-tensile steel with spot-welded sheets.
3—Low-alloy high-tensile steel with riveted sheets.
4—Low-alloy high-tensile steel with stainless-steel fluted exterior.
5—Low-alloy high-tensile steel with riveted aluminum sheets.
6—Aluminum framing with riveted aluminum sheets.
7—Aluminum framing with fluted anodized aluminum exterior.
8—Steel underframe with aluminum superstructure and sheathing.

If you think the making of some 500 to 2,500 drawings for each of these lots and the issuing of 500 to 1,000 requisition sheets per lot did not involve one or two headaches, then think of the work involved in making changes required by some of the railroads during the progress of the engineering work and sometimes after construction was well advanced, and I am sure you will feel slightly dizzy. And the above is the work of only one car plant. A survey of all the builders of passenger cars for the postwar period shows 3,781 cars ordered of 316 basically different types from 424 different floor plans. I doubt if any other manufacturing industry with equal volume of business ever faced such a highly "customized" program. It is certainly not surprising that costs have been high when it is realized that quantity purchases of materials have been impossible and organization of labor forces and provisions of jigs and fixtures have, of necessity, been geared to the small lots of cars.

The tremendous amount of engineering work involved because of the wide variation in designs has, in many cases, been the bottle-neck of production. Experienced personnel in the numbers necessary to produce drawings and requisitions as rapidly as needed to match possible shop schedules have never been available, making it necessary to train recruits from other fields of engineering.

What Does the Public Want?

During the period immediately following World War II when considerable publicity was being given to the cars being ordered by the railroads, this letter appeared in the "Letters to the Editor" column of the New York Herald Tribune:

"The railroads, through questionnaires, are trying to determine what the people want postwar trains to be like. One gets the impression they are planning a circus on wheels, with radios blaring, snack bars everywhere, children darting about on roller coasters, movies, a library and smoking and drinking all over! Bedlam, in short.

"Some one ought to tell the railroads that what we travelers want is simply safe, comfortable, inexpensive transportation. That's all. Seats designed by a furniture man and not by a railroad engineer. Good food. Comfortable foot rests on long journeys, instead of metal bars; clean cars; toilets that flush; a place to put baggage and luggage out of the way; good air conditioning; polite and intelligent service. In short, a perfection of existing facilities."

Standardization Limitations

It is not to be expected that railroad passenger cars can be standardized 100 per cent in all details, or that the number of designs can be reduced to only three or four types. A certain amount of variation is just inherent in the business. For example, more than one type of coach must be considered to meet the requirements of short trips with high traffic density and for the long overnight trips. Within these limitations, however, a very considerable amount of standardization is possible, including complete cars of certain generally used types and interchangeable parts and units for such types as cannot completely follow a standard design.

In considering variations from standard designs, care must be exercised to make sure that departures are necessary and that any advantages, real or fancied, are of sufficient importance in bringing in additional revenue or in savings in operating cost to justify the additional cost and production delays involved. For example, we cannot understand why diner kitchens for serving 36 to 48 passengers must have entirely different kitchen dimensions

Why must diner kitchens for serving 36 to 48 passengers have different dimensions and arrangements on each railroad?

and detail and arrangement of fixtures on each railroad for whom we have built this type of equipment.

Any standards adopted must, of course, be subject to change as new designs are developed and as new materials become available. No standard should be made so inflexible and permanent as to prevent improvement.

A.R.C.I. Committee Goes to Work

In June, 1948, W. T. Faricy, president of the A.A.R., received a letter from the chief executive of one of the larger railroads which read:

"Recently, in receiving bids for a number of passenger cars jointly with some other railroads, it was necessary for all the bids to be declined because of the great advance in price, as well as the extremely high price.

"It has been suggested that the A.A.R., through its Mechanical Division, probably ought to recommend a standard passenger car and several types of sleeping cars, in order to obtain a lower cost.

"There is so much individuality in this question of passenger cars, I don't know whether the suggestion is a feasible one or not, but I am referring it to you for your consideration."

This problem was referred to the Mechanical Division of the A.A.R. and to the American Railway Car Institute. The latter called on its Committee on Passanger Cars for its recommendations. This committee consists of F. L. Murphy (chairman), chief engineer, Pullman-Standard Car Manufacturing Company; R. Furrer, vice-president, engineering and research, American Car & Foundry Co.; Gen. G. M. Barnes, vice-president, Budd Company, and W. F. Kamman, Jr., chief engineer, St. Louis Car Company. The first meeting was held on July 27, 1948. At this meeting and at subsequent meetings assistants of the committee members also aided in the detail work. The wholehearted co-operation of the representatives of the four car builders was evident from this first meeting and all decisions have been made unanimously.

A review of the situation disclosed some degree of standardization already established:

1—An overall length of 85 ft. over coupler pulling faces was being generally used.

2—The A.A.R. cross-section contour for passenger cars was adopted as standard in 1940.

3—The A.A.R. construction specification was advanced to standard in 1945 and is generally accepted by railroads and car builders as representing the minimum for strength requirements.

4—A standard baggage-car floor plan and specification, A.A.R. Circular DV-1175, was adopted as revised June 25, 1948.

5—Battery-box dimensions and some details were adopted as standard in 1945.

6—Tightlock couplers, wheels, axles, and some other details are covered by well-established A.A.R. standards and specifications.

What the Committee Has Accomplished

The A.R.C.I. committee decided to attack, first, floor plans for miscellaneous passenger-train cars, including baggage, baggage and mail, baggage-dormitory, coaches, parlor cars, diners and observation-lounge cars. After several meetings a set of plans was agreed upon as acceptable to the four builders. These, assembled in booklet form, included seven basic designs which, with some variations and combinations, comprise a total of seventeen floor plans. I quote from the foreword in the book of proposed standard plans:

"These floor plans are based upon a careful study of all similar cars built in recent years and have been adjusted to conform to varying traffic requirements throughout the country. While maximum economy has been a primary consideration, it is believed that all recent developments which have met with general acceptance have been included or improved upon and that the proposed cars are more than equal to the best cars on the roads today.

"In addition to permitting more economical construction, these plans have been designed to simplify and facilitate maintenance and to minimize stock parts.

"Some of the more outstanding features of the plans are as follows:

"1—All cars, particularly coaches, have washroom and toilet facilities above existing standards. Luggage lockers and adequate miscellaneous locker space have been pro-

vided in every instance. These modern trends have been recognized even though a slight increase in passenger capacity might have been possible in one or two instances if less consideration had been given the overall picture.

"2—Window areas have been increased beyond even the most recent developments. Glass sizes have been standardized, and the number of sizes reduced to a minimum. Seat arrangements have been carefully adjusted to conform to the window spacings.

"3—Electrical lockers are sufficiently large to take care of any and all equipment that might be installed in them, and accessibility for maintenance is excellent. Additionally, being located similarly in all cars, equipment can always be installed in the same relation, reducing the difficulty in locating maintenance problems.

"4—Complete flexibility is provided for seats, floor coverings, upholstery, paint and trim, decorations, and all other fittings which do not involve the besic design.

"Degree of luxuriousness and the individuality of the car, in consequence, can readily be adjusted to reflect the wishes of the ordering railroad.

"These floor plans are not complete in every detail. They do, however, outline seat spacings, room sizes, room arrangements, window spacings, locker locations, and all main features. Individual builders may vary some dimensions or details to suit their construction and practices, but so far as the public is concerned, the accommodations in each type of car would be the same regardless of the builder."

This report was submitted by S. M. Felton, president of the A.R.C.I., to Mr. Faricy in April, 1949. It was immediately referred to the A.A.R. Mechanical Division committee on minimum specifications for passenger equipment cars. A joint meeting between the A.A.R. committee and the A.R.C.I. committee was held on June 1, 1949. The comments of the A.A.R. committee members have now all been received and tabulated for further discussion and final decisions at another joint meeting.* In the meantime, a committee representing the Operating-Transportation Division of the A.A.R. has been requested to study these plans and to co-operate with the Mechanical Division committee. It is sincerely hoped that these efforts will soon result in the adoption of these plans by the A.A.R. as standard, with such modifications as may be agreed upon.

A composite clearance outline has also been submitted to the A.A.R. by the A.R.C.I. committee. Uncertainty as regards tunnel clearances has always been a source of great difficulty. It is hoped that the outline submitted will be acceptable to all railroads so that standard designs suitable for interchange may be developed with certainty.

Futher Steps in View

At a later date the A.R.C.I. committee proposes to submit standard sleeping-car plans of several types for consideration. This subject has been purposely delayed to permit the full development of passenger reaction to the many varied arrangements which have been built since the war. And this is a subject which really needs a going over. At last count there have been in the postwar group of sleepers at least 22 different types based on the number of drawing rooms, compartments, bedrooms, roomettes and open sections included in the plans. Differences existed in the floor plans for almost every lot of each of these basic types as to the detail arrangement, location of the rooms, lockers, porter's accommodation, toilet arrangements, etc.

At the present time the subject of specialty designs and application conditions is being actively developed. The A.R.C.I. committee does not propose to recommend specific devices of particular manufacturers as standard. It does propose to set up standard application dimensions and size limitations. Consultations with the manufacturers is bringing out a willingness on the part of practically all of them to agree to changes necessary to meet the proposed standard conditions to the end that any make of specialty desired or specified by a railroad company may be used without any change in the standard supporting members or connections.

No individual can do this job alone. If everyone connected with the industry, including railroad, car builder and specialty manufacturer, does his part, a very substantial contribution can be made toward improvement in the railroad passenger travel situation.

* * *

* In its report at the annual meeting of the Mechanical Division held at Chicago June 26-28, 1950, the General Committee stated that "this project is rapidly nearing completion and will be submitted to the member roads for approval within a very short time."

Some Ways To Reduce Hot Boxes

Eight specific recommendations are advanced based on data accumulated during 25 years of study and service

*By T. W. Potter**

IT MAY surprise many to know that railroad cars as a whole are operating 99.95 per cent free of hot boxes. The figures are based on hot boxes per month averaged over a year's period. The elimination of the .05 per cent failures may seem a difficult if not impossible task but even this small percentage represents an average of 8,000 car setouts a month, and perhaps three times that number in some hot months. President Metzman of the New York Central has aptly described hot boxes as the "scourge of railroading."

When analyzing means of preventing hot boxes, the major remedy is found to be a well-planned and executed method of inspection. Inspection costs will be increased, but the total cost to inspect and repair the equipment should be less than that now expended for repairs after cars are set out on account of hot boxes. In other words, it should cost less to remove the cause than make repairs after the hot box has occurred. Additional benefits, of course, should be reflected by increased revenue from improved service and better satisfied customers.

There are 1,902,265 railroad-owned cars and 263,747 private line cars in operation. A continual wearing out and damaging of journal box parts makes it necessary that defects be found and corrected before causing failures and train delays.

53,300 Potential Hot Journals

It is hard to realize that approximately 53,300 journals are at this moment operating, undetected, at higher than normal running temperatures. These are in addition to potential failures located and corrected daily by ordinary inspection methods, and represent .33 per cent of the total journals in service. The 53,300 may not all fail at once, but could run several days before failure. If these boxes were carefully examined for the cause of excessive temperature, the results would show roughly: 29,092 bearings with defects developed in service; 13,538 with excessive foreign matter such as lint, commodity dust, snow, water, etc., which had collected between the bearing and journal; 6,503 defective journals; 3,743 with no defect within the journal box, but heating due to improper load distribution or defective car construction or condition; 318 with journal packing too wet to wick or filter the oil; 106 with insufficient oil.

This breakdown of causes was made by means of various yard checks, using organized thermal inspection crews to locate the potential failures before they occurred.

Abnormal bearing temperatures are responsible for the excessive number of hot boxes during hot weather. During cold weather, the same conditions may be present, but because of the cool air circulating around journals carrying off the excess heat, the bearings do not always reach the failing temperature, which is the melting point of the bearing lining.

These defects cannot be detected by the ordinary inspection methods given cars at most terminals. They can be detected only by opening the lids and feeling journal

* Journal Box Servicing Corporation, Chicago.

ESSENTIAL STEPS TO BE TAKEN

(1) Change truck design to prevent the unseating of journal bearings when cars are coupled at excessive speeds or when brakes are applied.
(2) Equip all cars with clasp brakes to prevent bearings from unseating on emergency application. This item can be eliminated if No. 1 is corrected.)
(3) Take positive action to limit the speed of coupling cars in switching and freight classification yards to two miles an hour.
(4) Provide thermal inspection of incoming trains to detect boxes with minor defects before trouble develops.
(5) Keep competent thermal inspectors on duty in sufficient numbers to give thorough attention to all cars.
(6) Reduce the time for periodical repacking, with its inspection of journal-box parts, to a maximum of 12 months.
(7) Provide a minimum viscosity index of 75 on new car oils.
(8) Enforce the provision that all journal-box packing used on cars in interchange fully meets A.A.R. specifications.

ends with a bare hand immediately on arrival of trains in yards. Placing a hand on journal boxes will not reveal the trouble, as the boxes are not yet hot enough but are on their way to give trouble if not discovered.

Almost every train of 100 cars has from one to six such boxes operating at higher than normal temperatures, but not yet hot enough to attract attention. They are potentional failures, but will continue to run until failure overtakes them, unless they reach a repair track for repacking and bearing inspection in the meantime. The hot weather months reap a harvest of these overripe ones, causing criticism from top railroad officials, magazine articles on causes of hot boxes, and much scratching of heads by mechanical officers for explanations satisfactory to their superiors. Frequently the oil or waste is blamed and manufacturers criticized unjustly.

A most interesting article in the December 24, 1949, issue of Railway Age, tells of 42,000,000 miles without a hot box on a fleet of cars. This is outstanding and is indicative of what can be accomplished. As pointed out, however, the cars were of 100,000-lb. capacity, carrying an average of about 25,000 lb.; were not operated in interchange; had full size journals; were not humped; had special draft gears, and received "closer attention than the average car." That these cars were given preferred attention is borne out by the improved record as compared to that of the first 73,000,000 miles which produced nine hot boxes. From this experience some improved technique was evidently developed to produce the better record. If this same kind of interest and service could be given all cars, the results would be comparable.

Reducing the load per square inch of bearing area by using larger bearings and journals does not appear to be the solution to improving the record. The over-all good performance of 99.95 per cent of journals is convincing evidence that the bearing size is approximately correct, and that undiscovered defects caused by wear and tear are responsible for the failures. Moreover, thousands of individual boxes and many individual cars are making as good a record, and doing it while carrying four to five times the load. One railroad has a record of four years' operating a fast merchandise train without a hot-box delay, equivalent to 47,000,000 car miles.

Roughly, there are two million cars operating in the country with 16,000,000 boxes, most of which must be examined carefully every day and defects corrected before the cars leave terminals if they are to operate without failure. It can be done if the interest is equal to it.

Basic Causes of Defects

Truck Design—Through the years, much improvement has been noted in the strengthening of car parts, such as sills, underframes, draft gears, couplers, etc. The increased shock received from humping, switching, and emergency braking, has made such improvements imperative. Nothing has been done, however, to relieve the journal bearings of the shock and battering received under the same conditions.

The main cause of bearing defects is directly related to truck design, which makes little provision for stopping the forward movement of axles at the instant of car-to-car impact or brake application. The axle travels in the box far enough to allow the journal to roll out of the bearing. To do this it must lift the car, forcing the journal diagonally into the packing and causing its displacement. While the bearing is lifted, lint or thread clinging to the journal finds its way under the bearing. As the bearing returns to its proper seat, the damage has begun and the box made ready for trouble on the line. Not infrequently a mass of packing is pushed under the lifted bearing during yard-switching. As a result, the waste manufacturer may be condemned for having short ends in the packing waste, yet the same thing would happen if every thread were a yard long.

The unseating of the bearing caused by damaging blows affects the hearing internally and externally, and increases the radius of the bore, thus preventing the use of full bearing area. If car designers will improve truck design to meet this condition, a major step will be taken to STOP HOT BOXES.

Rough Handling—Sharing with inadequate truck design as a contributary cause of hot boxes is the rough handling cars receive in switching. In a recent publication in *Railway Age*, President Barriger of the Monon brought out the need for improvement. His article dealt principally with damage to freight, but rough handling is also a serious cause of hot boxes. He pointed out that cars should be coupled at not over two miles an hour, and that if coupled at speeds greater than four miles an hour, such impact then comes under the heading of collision. If cars are coupled at two miles an hour, the movement of the axle will not be so serious, but when coupled at excessive speeds, with the axle loose in the box, the entire journal-box assembly receives serious pounding. Frequently the fillet of the journal is damaged against the partition of the dust-guard groove, and the sides of the journal boxes are bent by internal blows from the journal collar. Cases have been noted where the bearing was completely displaced, landing under the journal and leaving the wedge to replace it on top of the journal. Rough handling, therefore, is plain destructiveness to equipment, as well as lading, and should be discontinued.

Wet and Dirty Packing—Another serious cause of trouble is water and dirt in the packing. Such conditions may be principally attributed to flood water covering the oil boxes, sifting of snow and dust, and allowing cars to run over the date limit for repacking. In addition, there exists the occasional flagrant violation of restenciling cars without actually doing the repacking or inspection work. Fortunately this practice occurs infrequently, but one such case is too many.

Clean oil and clean waste are essential to good lubrication. Much progress has been made in this respect. The situation in this regard, however, was not improved in

1942 when the time for periodic repacking and inspection of journal boxes and contained parts was increased from 12 to 15 months, while at the same time the mileage per car per month was about doubled. Some roads repack system cars with packing that cannot be used on foreign cars because it does not meet A.A.R. specifications, yet the same system cars travel country-wide, causing trouble and delay. The existing specifications are very liberal, and every railroad should at least meet their requirements.

Everything Depends on Inspection

To effect maximum improvement in car journal operation, everything depends on an extraordinary inspection system. To discover the 53,300 slightly overheated journals which are presently being overlooked, requires that the eight boxes of every moving car be inspected at least once each day. This inspection must be so carefully executed that none of the 53,300 defective boxes will escape detection and on-the-spot correction. Trouble shooters in automotive, airplane, and Diesel engine work are more thoroughly trained and experienced than mechanics who make the repairs. The industries referred to find such procedure highly satisfactory. It may be expedient for the railroads to benefit similarly by enlisting lubrication specialists to train car inspectors and oilers in the proper technique concerning elimination of defects. Oilers and inspectors for the most part may be expected to carry out their assignments efficiently if properly trained, informed and permitted sufficient time to do their work.

Thermal Inspection—The best known method of discovering these slightly over-heated boxes is that of thermal inspection. Inspectors must be available on arrival of trains, and immediately perform the inspection by opening lids and placing the bare hand on the journal, marking with chalk those that show overheating, and jacking the cars to find the cause. Generally, but a few minutes are required if facilities are conveniently arranged; otherwise, cars should be set not on an adjacent track for correction and forwarding in a later train. Obviously, it is important to supply an adequate force of trained inspectors to make sure the thermal inspection is properly made. When cars have not moved far enough to warm the journals, more careful inspection is required using all means of detecting defects.

The breakdown of causes of trouble concerning the 53,300 boxes was determined and verified from actual thermal inspections on one large railroad. If all roads started this careful inspection at once, most of these 53,300 dangerously defective boxes would be corrected within two or three days. Thereafter the number located would be small, but the most vigilant inspection would be necessary to maintain best performance.

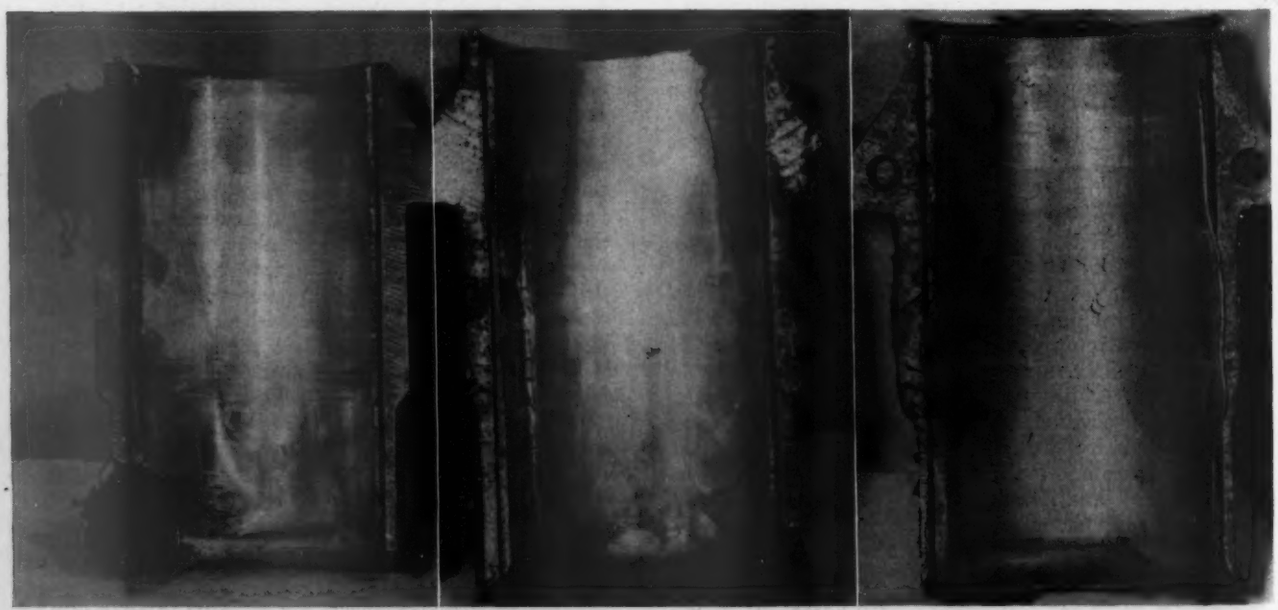
As to the ordinary inspection given by most railroads, many are making an honest effort to keep the journal boxes and contained parts in good condition, free from defects that cause hot boxes; others pay little or no attention to this feature. Improvements can be made by co-ordination of efforts through the A.A.R. In most respects, A.A.R. specifications and standard practices are sufficient to obtain good performance. It is exceedingly important, however, that all owners and operators give their complete cooperation in maintaining better than minimum standards.

The reports of the A.A.R. Committee on Lubrication of Cars and Locomotives, concerning "Hot Boxes—Cause and Prevention," Circulars DV—1064 and DV—1191, are very commendable.

The Car Department Officers Association as well is deserving of commendation for the recommenadtions offered September 19, 1949, by their Committee on Analysis of Train Yard Operation to Improve Performance.

Car Oil

Viscosity Index—Most car oil purchased by the railroads is generally satisfactory for good performance except in cases of extremely hot or cold weather. To meet these extremes, the need is for an oil that will not break down in lubrication during the hotest weather and still be able to avoid rolling of packing in boxes in extremely cold weather. The spread of this temperature range is measured by the viscosity index of the oil. The higher



Left: Waste pulled under a journal bearing hot at each end—Center: How the bearing metal flows when a standard bearing is applied to an undersize journal—Right: A spread lining caused by journal movement toward the side of the box

the viscosity index, the wider the range between these two critical points. Viscosity index should not be confused with the pour point of an oil. Some oils with a below-zero pour point may have a low viscosity index, and would cause trouble in extremely hot or cold weather.

It is doubtful if many hot boxes are caused from poor quality oil or from lack of sufficient oil in the box, though such excuses are often given. More failures are caused by too much oil which floods the journal, carrying with it lint and dirt which have not been filtered through the mass of waste. The lubrication ability of the oil now used far exceeds the demands of journal lubrication except as pointed out on viscosity index.

Cut-Back Oil—If it is necessary to use cut-back oil, the regular oil should be reduced with blending oil of high viscosity index, low pour point, and not less than 300 deg. F. flash point. All railroads should share in an effort to improve the oil by buying, when necessary, oil of high viscosity index. All oil going into boxes should meet specifications.

Journal Bearings

It is evident from many years of service that cap bearings on axles are the simplest of all load-carrying bearings. They are the easiest to inspect, repair or renew, the least expensive to lubricate and maintain, and by far the most economical in original cost.

The lowering of journal-bearing standards in the design of the "emergency bearing" during the war, apparently has been partially responsible for a decided increase in hot-box train delays, which has not been completely overcome to date.

The recess in the back of the journal bearings may be conducive to increased failures, because it further weakens the shell of the bearing which previously was subject to distortion from the shock of braking and switching. The recess also appears to effect the concentration of weight on the collar and fillet which are the hardest areas to lubricate.

The narrowing of the bearing width between the lugs in the journal box has allowed the sides of the bearing to take more severe shock and bruising during humping and switching, as well as during brake applications on single-brake equipment.

Bearing Trimmers Remove Spread Lining—New journal bearings are made with greater radii than new journals; therefore, a still greater difference in radius exists when applying a new bearing to a journal turned down to the limit dimension. To reach compatible radial surfaces, the bearing lining must necessarily mold itself in service. During this seating period, excess babbitt spreads over the edge of the bearing, interfering with the oil circulation. Foreign matter and lint are trapped at the bearing edge, preventing passage of an oil film between the journal and the bearing surfaces. Portable journal-bearing trimming machines are used on many repair tracks to remove this over-run lining that causes so many journals to operate at excessive temperatures. Following thorough inspection, hammer testing and trimming, the bearing is reapplied to the journal from which it was removed and from where it had seated itself in service.

Rebroaching—Rebroaching babbitt-lined bearings to the original radius for application as new bearings is not the best practice for the principal reason that babbitt having once shaped itself to a journal, received pounding and impacting, undergoes a work-hardening sometimes as high as 48 per cent.* Though properly rebroached, the fact remains that the babbitt lining has become hardened through service, and in most cases will not lend itself to reseating.

Tolerances on bearing and journal lengths are excessive for best performance, and in some extreme cases a short bearing and a long journal at the same box location will cause considerable flange cutting on the opposite wheel.

Journal Box, Wedge and Journal

The journal wedge and top of the journal box should have radii maintained to a lower limit of wear than the present A.A.R. limitations, as these are prescribed as maximum wear allowable and not necessarily a working standard.

The journal boxes with ribs cast within are a great improvement over many of the old boxes in service. The rib is an asset in holding the journal packing in place and in giving the box packer a marker for use as a guide in packing. Many square-bottom boxes in service also help to hold the journal packing in proper position.

There is no doubt that deflector strips give exceptional results in keeping water, snow, and dirt from entering the journal boxes regardless of the fit of the lid.

Journals are finished by roller burnishing, a method which has given satisfaction in the past, but because of the lack of a geometrically perfect surface, some time is required in service before the finish of the journal and the bearing become well fitted to each other. Unquestionably, the main cause of new journal failures may be attributed to this imperfect surface. In addition, the permissible tolerance of journals, diametrically and axially, is conducive to poor bearing fits. However, if careful attention is given during the break-in period, while the bearing and journal are becoming adjusted to one another, they will still give excellent performance.

If the journal position in the bearing could be confined to a maximum movement of $\frac{1}{16}$ in., most of the waste grabs and distorted bearings could be eliminated and major progress would thereby have been made in the stopping of hot boxes. Thermal cracks, directly related to hot journals, would be dispensed with, as well as the necessity of concern over intergranular penetration of copper. It is common knowledge that copper penetration into the journals makes an axle very dangerous to use in service as it is likely to break off while cold, causing expensive derailments. Journals that have been subject to high temperature in the presence of the molten copper of the bearing, should not be returned to transportation service.

Journal Packing Waste

Journal waste is blamed for many failures where it is not at fault. It has only two purposes: a filter medium and a capillary transfer medium. Both cotton and wool threads or a mixture of these in any proportion have these qualities. The inclusion of solids, such as rayon, nylon, sisal, etc., lower the efficiency of fibrous materials and actually act as bleeders, decreasing both the filtering and capillarity in relation to the percentage of such materials.

The best performance can be obtained from clean untreated cotton or wool or a mixture of the two. The waste should be checked more closely than ever before because so many types of synthetic threads and chemically treated fibers are becoming a part of the waste supply. Some of

(*Continued on page 515*)

* See Series A No. 9. Technical publication of the International Tin Research and Development Council.

Special equipment simplifies the job of handling wheels

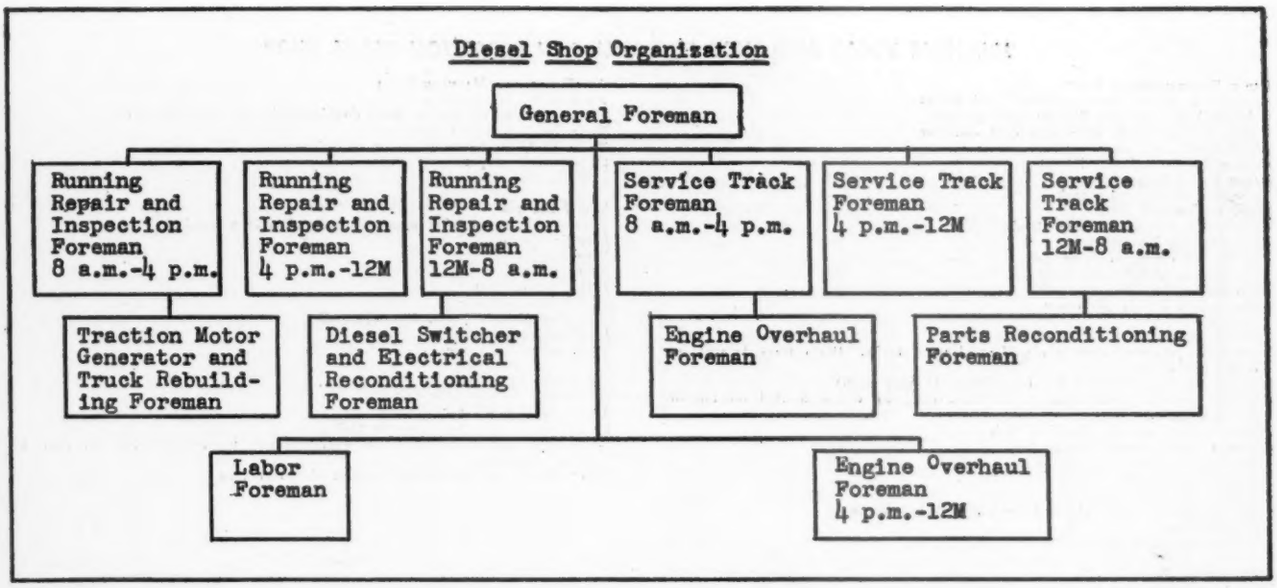
The Lackawanna's Diesel Shop at Scranton, Pa.

After a thorough survey had been made to determine the operating and economic advantages of the replacement of steam by Diesel-electric road motive power, the Delaware, Lackawanna & Western inaugurated Diesel road service in May, 1945, after having had since 1926 experience with Diesel power in switching service. The first road power was for road freight service and consisted of twenty 1,350 hp. Electro-Motive units, twelve of which were used as head-end power to make up three-unit 4,050 hp. locomotives and the remaining eight, of a different gear ratio, were used as two-unit 2,700 hp. pushers. These latter locomotives are used to assist trains over the heavy-grade territory east and west out of Scranton, Pa., and east of Groveland, N. Y., where the grades range from approximately 8 to 20 miles in length and with gradients of from 1.2 to 1.73 per cent.

The immediate results of the Diesel operation indicated the potential savings due to high availability, reduced manpower for maintenance and servicing and the ability to substitute modern and less expensive facilities for inspection, servicing and maintenance than had been required for steam power.

During the first year of Diesel operation it was found possible to retire 47 steam locomotives of the heavy Mikado type and subsequently additional Diesel locomotives were added to the fleet for both road freight and passenger service which permitted the retirement of a substantial number of steam units in addition to those previously mentioned. At the present time the fleet of Diesel-electric road locomotives on the Lackawanna consists of 60 freight units and 15 passenger units and the retirement of steam power from 1945 to this year totals 117 locomotives—16 passenger and 101 freight.

As soon as the road freight power went into service in 1945, it became obvious, from the satisfactory results obtained, that further expansion of the Diesel operations were in prospect and the Lackawanna immediately took steps to provide modern facilities for servicing and



maintenance. The original Diesel service shop was built at Scranton, Pa., in 1945 and consisted of a five-track layout with two platform-type inspection and assembly tracks about 170 ft. long, space for engine overhaul, parts reconditioning, electrical work, stores and office space. Since then additions have been made to the building in the form of two additional platform-type tracks (with space for a future third track), additional shop space for electrical work, engine overhaul and parts reconditioning.

The original shop was described in detail in articles appearing in the Railway Age for November 23, 1946, and in the May and August, 1946, issues of *Railway Mechanical Engineer*.

Method of Handling Power

Diesel units in freight and passenger service are scheduled into the shop on a mileage basis. Daily reports are made to the chief clerk at Scranton. Shops from the various terminals over the system showing the total locomotive mileage as recorded on the speed recorder on the locomotive. When a locomotive has run out its mileage, the transportattion department is so notified and they hold the locomotive out of service on arrival at Scranton.

The locomotive is then serviced and sent to the Diesel shop for routine inspection. The inspections are made in accordance with work reports previously made by a clerk using an EMD slide-rule chart. A number of items other than those which appear on the slide-rule chart are also on this report. Such items are I.C.C. inspections, truck changes on account of wheels nearing the wear limits, tightening down of power assemblies installed in the engines the previous two trips, oil changes recommended by the laboratory as a result of analysis, and new specialties or equipment to be installed on the locomotive as improvements.

The slide-rule chart was made up with the primary purpose of scheduling maintenance on the locomotives so that it would be evenly distributed through the inspection periods and so that at no one inspection period would there be any excessive amount of work, making it necessary to hold the units out of service more than the nine or ten hours that they are usually in for the inspection.

The exception to this is the periods at which the engine and unit overhauls are scheduled at approximately 180,000 miles (the axact mileage depends on the fuel consumption rate per mile for the various classes of locomotives). At one test (No. 36) the unit is held out of service and all the power assemblies (heads, liners, pistons, connecting rods, etc.), oil cooler, fuel pump, and any subassemblies that may be worn or leaking oil through the various joints are removed. The engine is then thoroughly cleaned and reconditioned assemblies are reinstalled. To facilitate this work, the roof hatch is removed.

Before the engine is opened up to remove the power assemblies, the electrical men blow out the main generator, auxiliary generator, resistor boxes and electrical cabinets, after which the equipment is either washed or wiped down with a solvent. The cables and equipment are inspected, repaired and repainted with insulating paint. All hose connections are renewed, the unit is reunit is repainted as needed, and trucks are replaced if needed.

The unit is then load tested and, if all temperatures, pressures, and the horsepower output are satisfactory, the unit is returned to service.

With this system the unit is then expected to perform as a new unit with a minimum of maintenance until the next overhaul period. This maintenance method has proved satisfactory and has materially reduced the out-of-service time for such items as water leaks, broken valves, broken rings, lube oil dilution, and bearing troubles. It also has helped in the problems of keeping the engines free of oil leaks.

It also has the advantage in that the mechanics rebuilding the engines become expert in their work and difficulties due to improperly applied bearings, power assemblies and the adjustment of the various parts of the engine are almost entirely eliminated. Further, the thorough cleaning of the engine and its component parts prior to reassembly eliminates the possibility of scoring of bearings or parts due to dirt.

This same procedure of overhaul is repeated at 360,000 and 540,000 miles, with the exception that additional inspections of equipment are made at 360,000 miles and the main bearings are renewed at this time. At 720,000 miles the unit is stripped and the engine, generators, con-

MACHINE TOOLS AND SHOP EQUIPMENT IN SCRANTON DIESEL SHOP

Parts Reconditioning Room
3 ft. by 6 ft. by 18-in. cylinder head stands
Cylinder head polishing flexible shaft grinder
Buffing and polishing lathe with dust collector
ZA-12 Zy-Glo Magnaflux
Honing fixture (cylinder liners)
40-ton hydraulic press
Valve grinder and valve rack
24-in. verticaldrill press
Cylinder head reconditioning stand
KC-3 portable Magnaflux
1,000-lb. jib crane, 17-ft. radius
16-ft. radius, 1,000-lb. jib crane
14-ft. radius, 1,000-lb. jib cranes
10-ft. radius, 750-lb. jib crane

Parts Cleaning Room
Four 32-in. sq. compartment air filter cleaning tanks. Drain trays located on outlet end of tanks
Bin-type draining ovens for flat type filters. (Engine room)
Draining ovens for cylindrical type filters. (Engine) Ovens located on top of bin-type draining ovens.
Michiana filter element cleaning tank
Michiana filter element storage box
Three 6-in. I-beam, 1,000-lb. hoists
Four transfer trucks
3-ft. by 6-ft. engine parts cleaning tank
4-ft. by 6-ft. 4½-in. cleaning tanks, cylinder liners and pistons
4-ft. 8-in. sq. rinse booth

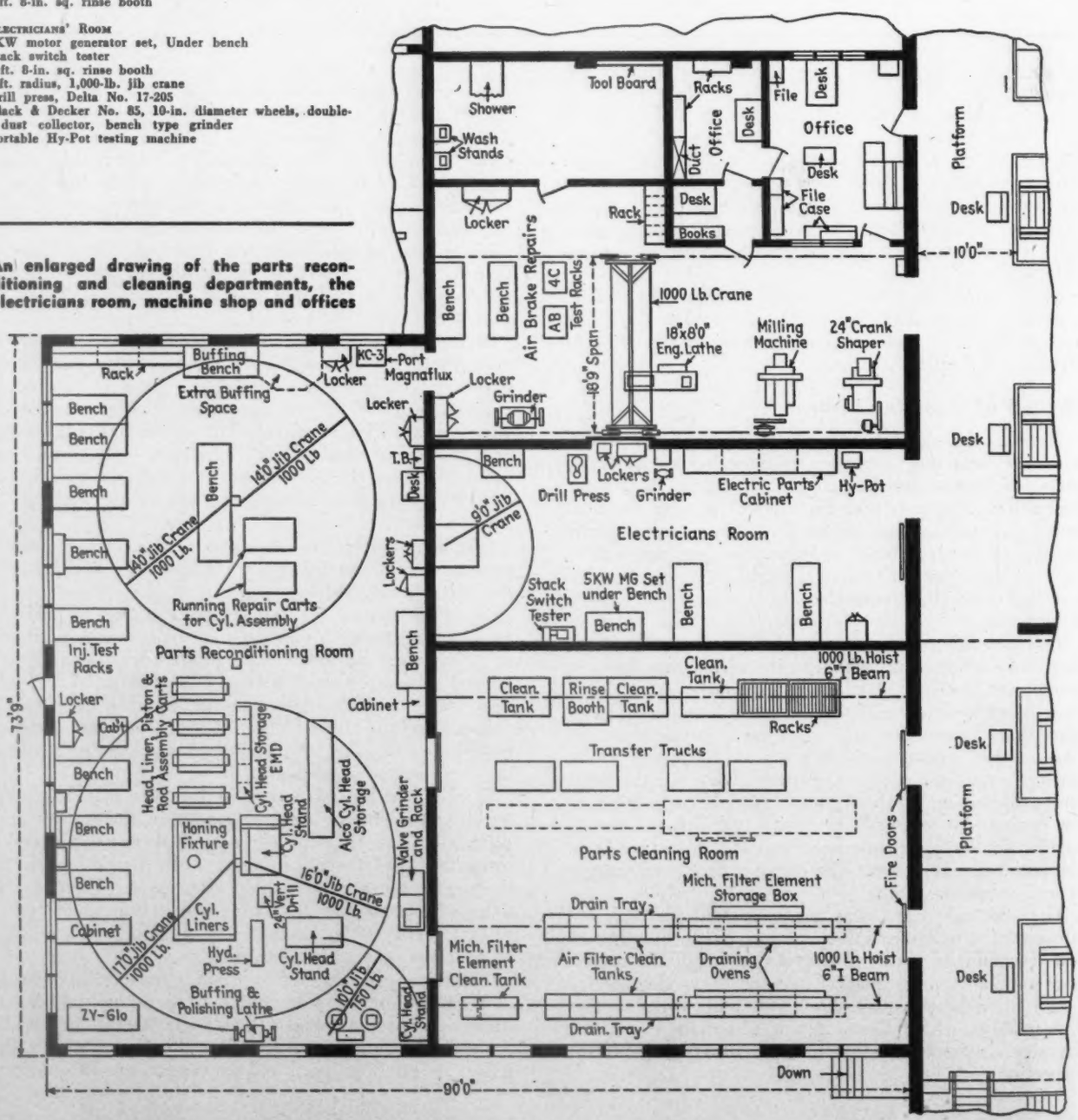
Electricians' Room
5KW motor generator set, Under bench
Stack switch tester
4-ft. 8-in. sq. rinse booth
9-ft. radius, 1,000-lb. jib crane
Drill press, Delta No. 17-205
Black & Decker No. 85, 10-in. diameter wheels, double-dust collector, bench type grinder
Portable Hy-Pot testing machine

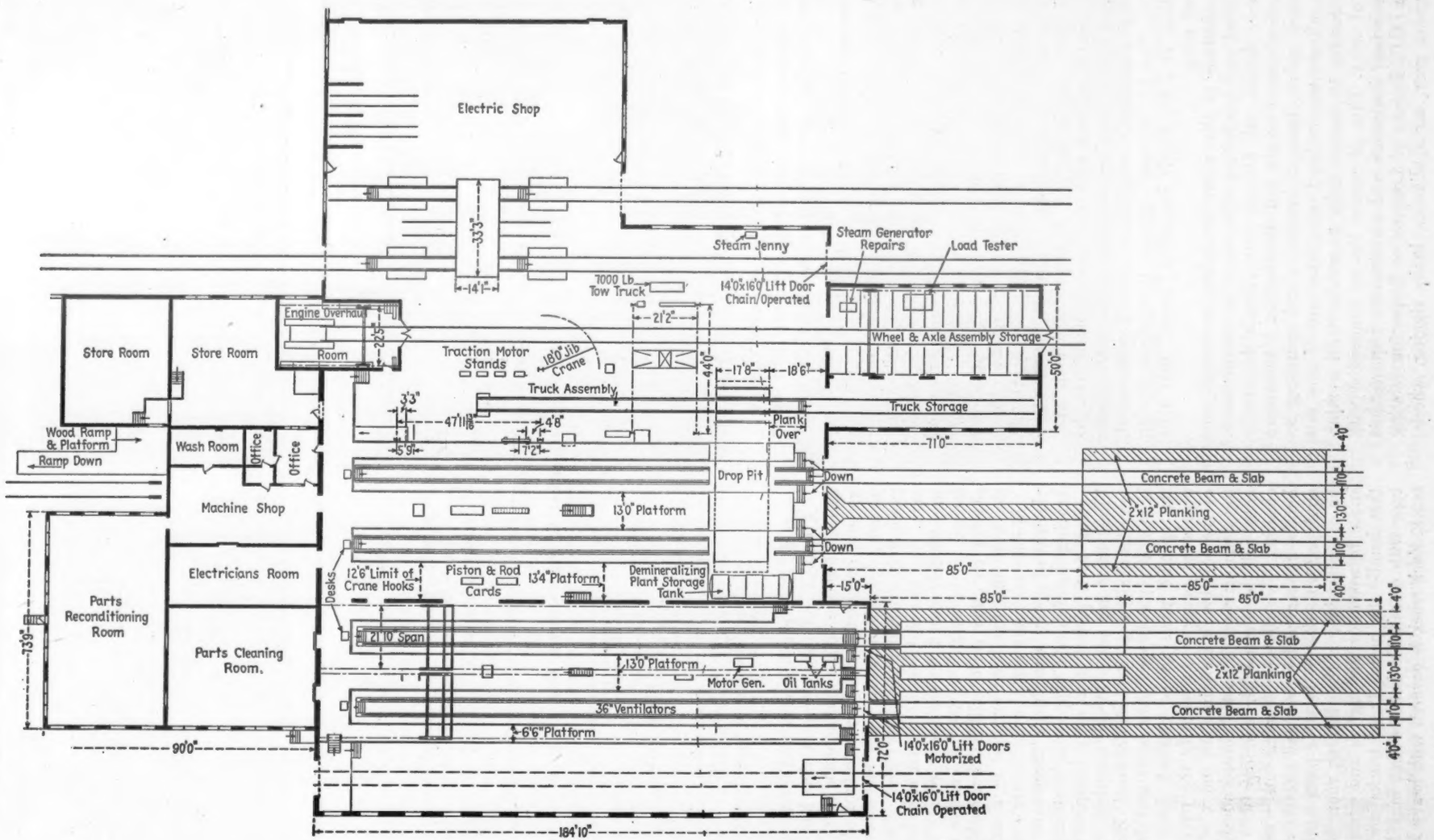
Air Brake and Machine Room
AB and 4C test racks
18-in. diameter by 2½-in. face. double Bridgeport floor grinder
18-in. by 8-ft. engine lathe
34-in. by 12-in. by 20-in. range milling machine, 12-in. swing
24-in. crank shaper
1,000-lb. crane

Truck Repairs
Four stands for traction motor, wheel and axle assemblies
Electric winch
Pipe bench
Arbor press
Brake rigging rack
20-ton electric crane
Three-ton electric crane, floor operated
Load tester, Portable
18-ft. radius jib crane

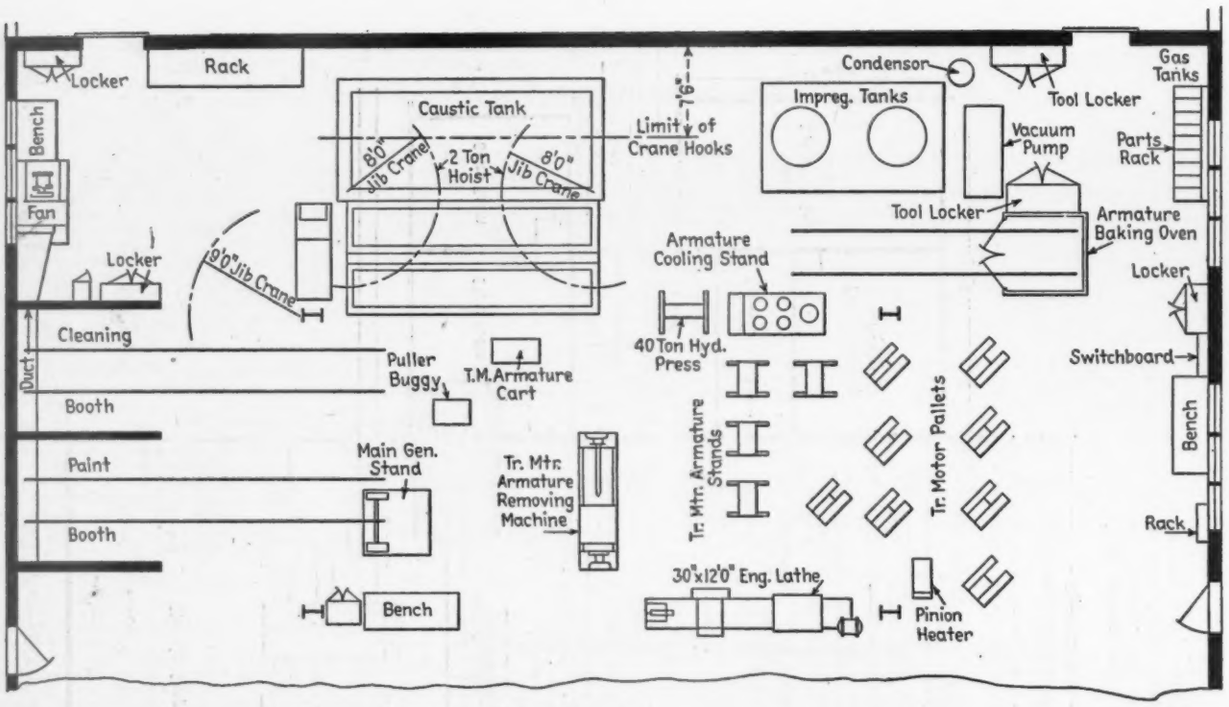
On Track Platforms
Piston and rod assembly carts
Demineralizing plant
8-ft. diameter by 26-ft. storage tank
Motor generator set, portable, H.V.W. interpole type, Frame No. 60, 750a, 6v, 375a, 15v, s.w.
Two 4,000-lb. floor operated, pendant, electric cranes

An enlarged drawing of the parts reconditioning and cleaning departments, the electricians room, machine shop and offices





The arrangement of the Lackawanna Diesel-electric locomotive repair shop as it is today. The original shop, built in 1946, has been expanded by the addition of two more tracks, with provision for a third through track, the enlargement of the parts reconditioning shops and outdoor wash and inspection platforms



Machine tools and shop equipment in the electrical shop

MOTOR REPAIR FLOOR
30-in. by 12-ft. engine lathe
Traction motor armature removing machine
Main generator stand
Hydraulic pinion puller, Portable. Also, two induction heaters for removing 15-tooth and 19-tooth pinions
Four traction motor armature carts
40-ton hydraulic press
Four traction motor armature stands
7,000-lb. capacity high-lift tow truck
Pinion heater
Armature baking oven
Impregnating tanks
Vacuum pump

MISCELLANEOUS
2-ft. 6-in. by 9-ft. buffing bench
Paint booth
Cleaning booth
Cleaning tank
7-ft. by 15-ft. caustic tank
8-ft. radius, 2-ton jib cranes
9-ft. radius, 500-lb. jib crane
60-ton traveling crane, 47 ft. $11^{13}/_{16}$-in. span—center bay.

tactors, motors, speed increasers, etc., are torn down and then rebuilt.

Maintenance Methods

The inspection and testing of Diesel-electric locomotives conforms, in general principle, to maintenance recommendations set up by the manufacturers of the locomotives. While the principles of the generation and control of electrical energy and its control for delivery to traction motors is not new or unfamiliar, the Diesel-electric locomotive presents a variety of new problems connected with operation, servicing and maintenance that are widely different from those with which the shop personnel have dealt in the past. The operating employees familiarize themselves with the various protective devices and trouble shooting problems. Alarms that indicate high engine and water temperatures, low oil pressure, oil, dilution, "no a.c. voltage" alarms, precautions during operation, etc., are highly important "musts" that must be dealt with.

In addition to the above servicing, personnel must check fuel and lubricating oils, water, air compressors, car body details, cab fittings, truck details (especially lubrication), sand supply and distribution. Maintenance personnel, on the basis of inspection and operating reports, mileage accumulated, etc., take care of any this work quickly to restore units to service with a minimum of delay. This, of course, has no connection with the periodical inspection and maintenance requirements of the I.C.C. Bureau of Locomotive Inspection relating to running gear, air appliances, brake rigging, wheels, journals, draft gear couplers and safety appliances.

A typical example is a unit that has accumulated its allotted mileage on the maintenance schedule calling for a general overhaul, or a minor failure of rods, liners or pistons. Inspection starts with the removal of the first piece stripped under the supervision of an assistant foreman. Any unusual condition that may have developed is immediately noted on the work report form that is attached to the outside of the locomotive cab so that employees on other shifts will be thoroughly familiar with the work that has been or must be done.

Mobile assembly carts or stands are used for each complement of piston assemblies. These carts are of the ball-bearing hand-drawn type with matching slots for securing each piston unit in a complete set of sixteen. These carts are taken to the cleaning room where they are chemically degreased and cleaned. The cleaning room is completely equipped with tanks and dryers adapted to the specific parts to be cleaned. Each vat is plainly numbered properly to identify the purpose and nature of the solution it contains. An index of all the vats in the cleaning room is posted conspicuously so that attendants will be thoroughly familiar with all phases of cleaning. Two rows of cleaning vats, wash racks, rinsing booths are served by overhead electric mono-rail hoists equipped with steel baskets for parts handling. These are on opposite sides of the cleaning room with ample work space between for the ingress and egress of the trucks that handle the parts. These trucks are the semi-pallet type with detachable handles that may be used on any truck. Each truck is covered with heavy Masonite to pre-

Head assemblies and injectors are handled at the location shown at left while the other view shows the speed recorder test stand

vent the damage to important parts. Special cleaning, rinsing and drying equipment is used for air filters, compressor and crankcase breathers.

A special drip rack truck with an inclined rack is used to hold 24 Michiana filters after removing them from the units on the ramp. This incline allows the residue to be held on a drip pan underneath the rack and avoids messing up the floor. Cylinder liners are returned to the room and steamed with high-velocity steam jets to remove any grit that may have remained after honing.

With the exception of exhaust valves all engine parts are completely wire brushed and buffed before any restorative maintenance is done. This makes the inspection easy and sure and augments the magnetic particle testing. While magnetic particle testing may not catch all the defects this method does an effective job of weeding out potential failures and allowing maximum service life to parts. This inspection is being extended to include vital parts in the piston and rod assemblies, particular emphasis being placed on fork rod baskets, fork and blade rods, piston pin carriers, piston pins and pistons.

The buffing of component parts is accomplished with one unit—a portable high-speed flexible shaft buffer. In the case of cylinder heads, a special stand allows the head to be rotated by the centrifugal force of the buffing wheel leaving the operator free to manipulate the brush into the recesses of the part. A rigid double-spindle heavy duty buffer is in the group for the smaller parts.

The cylinder head reconditioning stand is of the roll-over type adapted to valve grinding and head assembly. A 24-in. heavy duty motor driven vertical drill has been adapted for valve seat restoration. This machine is fitted with a jig to accommodate the inverted head, and a special cutter has been developed for seat reconditioning which uses a valve steam mandrel as a pilot and operates at 60 r.p.m. enabling the operator to note exactly what the condition of the seat may be at any moment during the operation. A rotating dial indicator is used constantly to check rotundity of the seat.

A motor driven valve facing machine with wheel contour restorer is in the group for exhaust valve work.

As may be seen from the shop arrangement drawing two jib cranes of special design, one mounted on each side of a central column, serve this area of the parts reconditioning room. Each of these cranes, of 16- and 17-ft. radius respectively, is equipped with a ½-ton electric hoist to facilitate the handling of heads, liners and complete assemblies.

A storage rack to accommodate 24 finished head assemblies is used in this shop department from which heads

Honing cylinder liners with portable equipment

Special rack trucks are used for head and liner assemblies

may be taken from either side of the rack. The use of this rack indicates, at a glance, the number of heads that may be available.

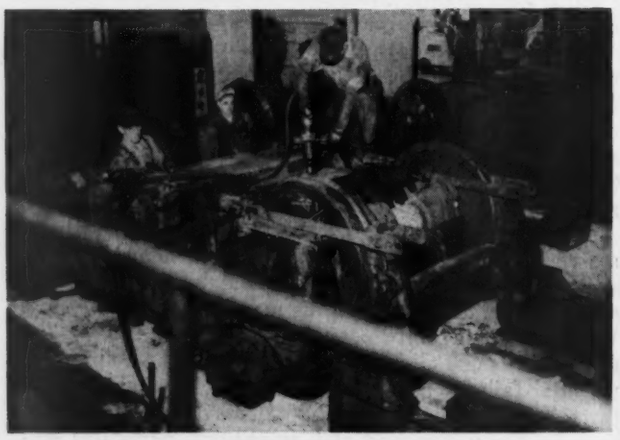
In the same department there is a cylinder liner reconditioning platform with ridge reaming and honing devices as well as facilities for determining liner wear and out-of-round conditions. Sizes are checked, marked and sorted for further use.

Loading stands, usually about 15 in. from the floor, are used throughout the shop to keep materials off the floor.

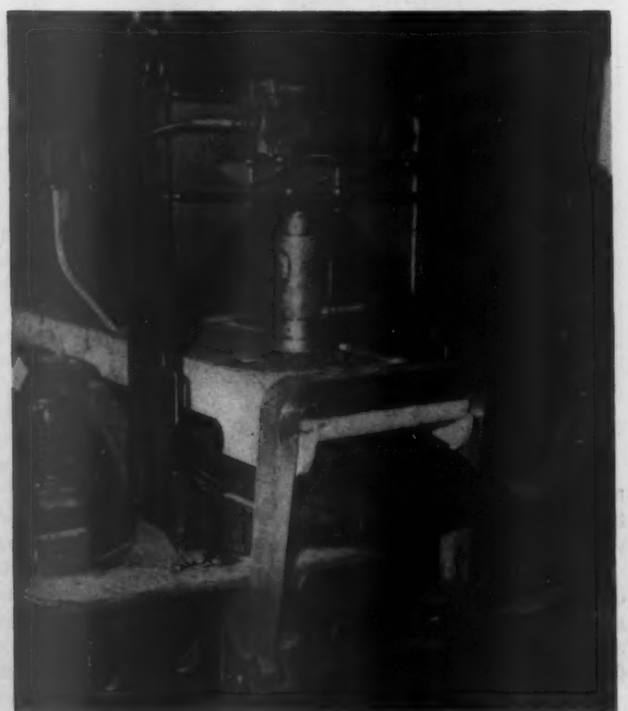
One of the tracks in the new part of the shop

Truck overhaul is facilitated by upside-down handling

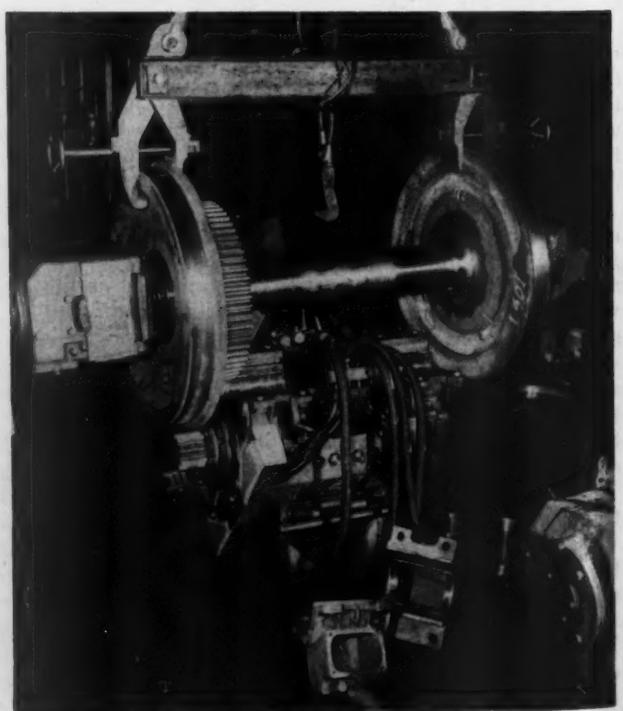
Here a traction motor assembly is being installed



A general view of the truck position



A fixture developed for compressing truck springs makes the job of spring replacement a simple one



A close-up of the traction motor job shown above showing the special fixtures for handling assemblies

In this area there are inspection and work benches for connecting rods, bearings, pistons, piston pins previously mentioned. During the complete process of removal, disassembly, cleaning, reworking, rigid inspection is maintained at all times.

In addition to routine inspection of compression ring groove wear, piston surface conditions, rigid inspections are made for vertical and circumferential cracks. A magnetizing device has been developed by the railroad to improve magnetic particle inspection. Up to this time the hollow cylinder has not adapted itself to important transverse magnetization and the new device will magnetize the two opposite axes thereby augmenting the Magnaglow. Fork and blade rods are given dry Magnaflux inspection after buffing.

Especially designed "donut" coils have been developed to magnetize fork rod baskets for Magnaflux inspection since the shape is so irregular. These coils are being used with satisfactory results. After the rods have been inspected a more thorough inspection is made of basket cap screws, threaded holes, serrations and also for nicks and burrs. Partial reassembly has to be made for enlarged bore checking. An angle surface plate with a vee block carrier for the pin and a dial indicator is provided to check rod alignment. Limit gages of the plug type are used for checking piston and liner wear.

Details making up the component parts of the cylinder head assembly such as rocker arms, rocker shafts, valve bridges, hydraulic lash adjusters, etc., after being returned from the cleaning room are disassembled and checked for excessive wear or damage and replaced when necessary. Oil channels are cleaned with meticulous care and precautions are taken to keep all assemblies to prevent dust or line from settling on them.

Cylinder test valves are checked for leaks and reground when necessary. Injectors are thoroughly cleaned, new filters installed and spray tip holes opened up. An injection device forces high-pressure oil through the nozzles to detect fuel delivery into the Pyrex glass vessel.

Cleaning Practices

Large parts such as crank cases, oil pans, etc., are cleaned by immersing in a large tank 8 ft. by 20 ft. by 10 ft. deep containing a solution of Wyandotte No. 307 and No. 11 cleaner. The concentration of the solution is 12 oz. of No. 307 per gallon and 4 oz. of No. 11 per gallon. Smaller engine parts such as heads, pistons, liners, rods, etc., are immersed in a solution of Oakite No. 19 having a concentration of 7 oz. per gallon. Rocker arms, wrist pins, etc., are cleaned in Oakite No. 9 and LTB oil in a 20 per cent solution.

Cylinder Head Assembly

After the heads are buffed they are inspected for cracks and damaged sealing surfaces. Stud holes are cleaned with a stiff wire brush and the test valve threads are cleaned with a ½-in. standard pipe tap. If a crack is found in a cylinder head it is scrapped and if the sealing surfaces are slightly damaged they are reconditioned by taking a slight cut in accordance with service recommendations.

Valve guides are reamed, checked for galling and wear and replaced if necessary. A 40-ton Manley hydraulic press is used for removing and installing guides. In the reconditioning of seats, a pilot is inserted in the guide and the inside and outside of the seat is reamed to conform to standards. The seat is then restored to service condition by grinding with a high-speed grinder. The seat is checked with a dial indicator and held to a tolerance of .001 in. Following the cleaning and buffing of exhaust valves they are inspected for evidence of galling or scuffing on the stem after which they are checked by Zyglo. If the valves pass inspection, they are refaced on a Sioux No. 663 refacing machine.

Rocker arms are completely disassembled and bushings, cam followers, shaft, etc., are inspected for damage or wear. Valve bridges and lash adjusters are completely disassembled and inspected for wear or damage. The small parts of the lash adjuster are cleaned in a Stoddard solvent and any gummy deposits on the parts are removed by cleaning in alcohol. After all parts have been cleaned and inspected, the bridges and adjusters are reassembled, the lash adjuster tested and when the valve bridge is completed, the assembly is ready for service. It is then placed in a special carrier. Defective cylinder test valves are reconditioned by reaming the valve seat in the body and grinding the seat surface. Damaged threads on the end of the valve body are repaired by welding and rethreading.

Before the cylinder head is removed from the reconditioning fixture, it is fitted with new or reconditioned valves, spring assemblies, spring retainers and locks. It is then placed in a special storage rack.

Connecting Rods

After connecting rods and baskets have been thoroughly cleaned and buffed, they are inspected visually for licks, burrs, cracks, etc., and if no damage is observed they are Magnafluxed. When this operation has been completed, the cap screws are inspected and the tapped holes in the fork rod are cleaned with a ⅝-in., 18-thread tap. The basket is then bolted to the fork rod and tightened to the proper torque valve. The bore of the rod is checked with inside micrometers and the measurements recorded together with the serial number of the rod. The blade is checked by means of a mandrel of proper diameter, coated with Prussion blue and brought to a high polish on a cloth buffing wheel. Both the blade and fork rods are checked for straightness by means of a dial indicator, surface plate and vee blocks.

The piston pin and bushing are inspected for evidence of scoring or over-heating, given dimension checks and replaced if necessary.

Connecting Rod Bearings

Connecting rod bearings are cleaned in Oakite No. 9 and LTB (long-time-burning) oil and given a dimensional check. Before measurements are taken, the bearing is polished by the use of No. 00 steel wool and solvent. The bearing is then placed in the fork rod and the basket with which it is to be used and the basket cap screws are tightened to the proper torque valve. The bearing bore is then measured with an inside micrometer and the measurements recorded. The upper bearing shell step thickness is checked by using a straight edge and feeler gage.

Pistons are carefully buffed, inspected for cracks or damage and the diameter measured and recorded. Then the ring-land clearance is determined and if it is excessive, the ring groove is enlarged and 1/32-in. oversize rings are installed.

Cylinder Liners and Assemblies

After the cylinder liners have been thoroughly cleaned and the sealing surfaces carefully buffed with a wire wheel, inspection is made for cracks, scoring and other

Three views of the shop exterior—the new part of the shop is shown at the left and a close-up of the wash racks is at the right

defects. The bore is then measured with a Standard gauge. This type gauge is used because it shortens the inspection time. The measurements are recorded together with serial number. If the liner meets the builder's service specifications, the ridge at the top of the liner is removed and the entire bore honed. Liners which do not meet the requirements are returned to the builder for reboring .060 in. oversize.

When an engine is undergoing major overhaul, the cylinder assemblies are removed and installed as a unit. Therefore, heads, liners, rods, pistons, etc., which are to be installed in a "major overhaul engine" are assembled as a unit in the reconditioning room. The liner is placed in a special assembly stand and the piston and rod are inserted. The head assembly is then applied and tightened to the proper torque value.

Blowers, Injectors and Water Pumps

When a blower is disassembled, the parts are cleaned by means of a trichlorethylene vapor degreaser after which parts are inspected and replaced if necessary. The blower is then reassembled and all clearances and backlash are kept within the service specifications. The measurements are recorded with the serial number of the blower.

When injectors are removed from an engine, they are placed in a special container to guard against dirt and damage. The injector parts are cleaned in Stoddard solvent, the filters replaced, check is made for rack binding and the assembled unit given a rountine "pop" test to insure that a proper spray pattern is being delivered and that the ball check valve is seating properly. Defective injectors are returned to the manufacturer for reconditioning.

Water pumps are completely disassembled and cleaned and all parts inspected for wear and damage. Shaft seals are replaced at the time of overhaul. Facilities are not available in this shop for making a head capacity test.

Maintenance in Yard and Shop

Certain routine operations on all road power and Scranton switching power having to do with progressive inspection and maintenance are performed either at the platforms just outside the shop or on the platform-type service tracks in the shop.

Road power maintenance is determined by fuel oil consumption and yard power is handled on a monthly basis. Turn-around and trip maintenance is handled at a service track adjacent to the Diesel shop area.

When road locomotive units are due for maintenance they are stopped at the wash rack outside the Diesel service shop. Trucks, fuel tanks, pilots and all of the under parts of the car body are thoroughly washed and cleaned. While this is being done, machinists inspect the top decks of the Diesel engines together with such engine parts and accessories as manifolds, injectors (to see that they fired), pressure and temperature gauges, gear train housings, pumps, governors and oil separators (for leaks); air boxes are checked for drainage and the general condition of the locomotive and its engine are checked at idling speed.

Electricians check cooling fans, shutters, auxiliary generator voltages, condition of equipment in electrical control cabinets and also check and adjust engine speeds if necessary.

The air man checks the condition of ringers, horns, windshield wipers, train signal equipment, brake equipment, p. c. switch, air compressor pressure controls, seals and safety features.

The pipe man inspects fire extinguisher equipment and seals, cooling system, pipe hose and radiators, and blows out and cleans the radiators if necessary. On a passenger unit, a dummy coupling is applied to the steam line and steam generators are fired and checked, as is also the steam train line.

After the trucks and running gear are washed and clean running tests are made and the locomotive is moved into the service shop where machinists make crank case inspection, connecting rod and bearing inspection, P-pipe, air box, piston ring, water and oil leak inspection.

Viscosity gauge readings and oil samples are taken for laboratory analysis and a magnet is run through the oil pan and strainer tanks to check for possible metal particles in the oil. If the accumulated mileage is such that the oil is due to be drained, the engine suction strainer tanks, and the lubricating oil filter bowl are wiped and cleaned. The lubricating oil filters, fuel oil filters and air filters are changed.

If any heads, pistons or liners are to be removed because they have run their allotted mileage or there are any head gaskets leaking, they are replaced at this time.

Load test readings, nut tightening, engine control adjustments such as injector timing, rack settings, lash adjusters and pilot valves are made if they are due on the progressive maintenance report.

First, second and third tightening, and after-service tightening of new assemblies are also handled at this point of inspection and a general tightening of bolts and nuts over the entire engine is handled at this shop when due.

The lubrication of pumps, couplings and the bearings of auxiliaries is handled in the service shop.

(*Continued on page 515*)

Alco–G. E. Road Switcher

MAJOR improvements in electrical equipment which result in an increase in continuous tractive force from 42,500 lb. to 52,500 lb. for the same 65-mph gearing have been made to the 1,600 hp. road switcher recently announced by the American Locomotive Company and General Electric Company. Dynamic braking is also now available on this type locomotive.

Steam generators may be applied with capacity up to 3,500 lb. per hour with an 800-gal. water tank. When the water storage tank is not required a 1,400-gal. fuel oil tank may be used instead.

The engine-generator assembly interchangeability between the road-switcher and other road locomotives has been simplified by substituting direct gear drive for belt drive on the road-switcher auxiliary generators.

The base weight of the 1,600-hp. all-purpose locomotive has been increased to 240,000 lb. and can be increased to 250,000 lb. as a modification. Uniform axle loading is maintained as fuel and water are consumed. The standard switching locomotive is equipped with schedule 6-SL air brakes with clasp brakes and shoes on all wheels of the four-wheel trucks. When six-wheel trucks are used single shoes are used on all wheels.

The underframe is a steel weldment and the superstructure is of welded steel plate. The operating cab is between the low hood covering the power plant and the hood provided for the steam generator. The hood in front of the cab covers the engine and other apparatus. The radiators are located in the forward end of that hood. The section of hood over engine and generators is removable. There is a bulkhead which isolates the generator. Doors in the sides and roof of the hood provide access to equipment.

The cab is of welded steel with controls on the right side facing the engine hood and two seats on the left side of the cab. Doors are located in the right side of the rear wall and the left side of the front wall, as well as in the rear cab wall for access to the rear hood.

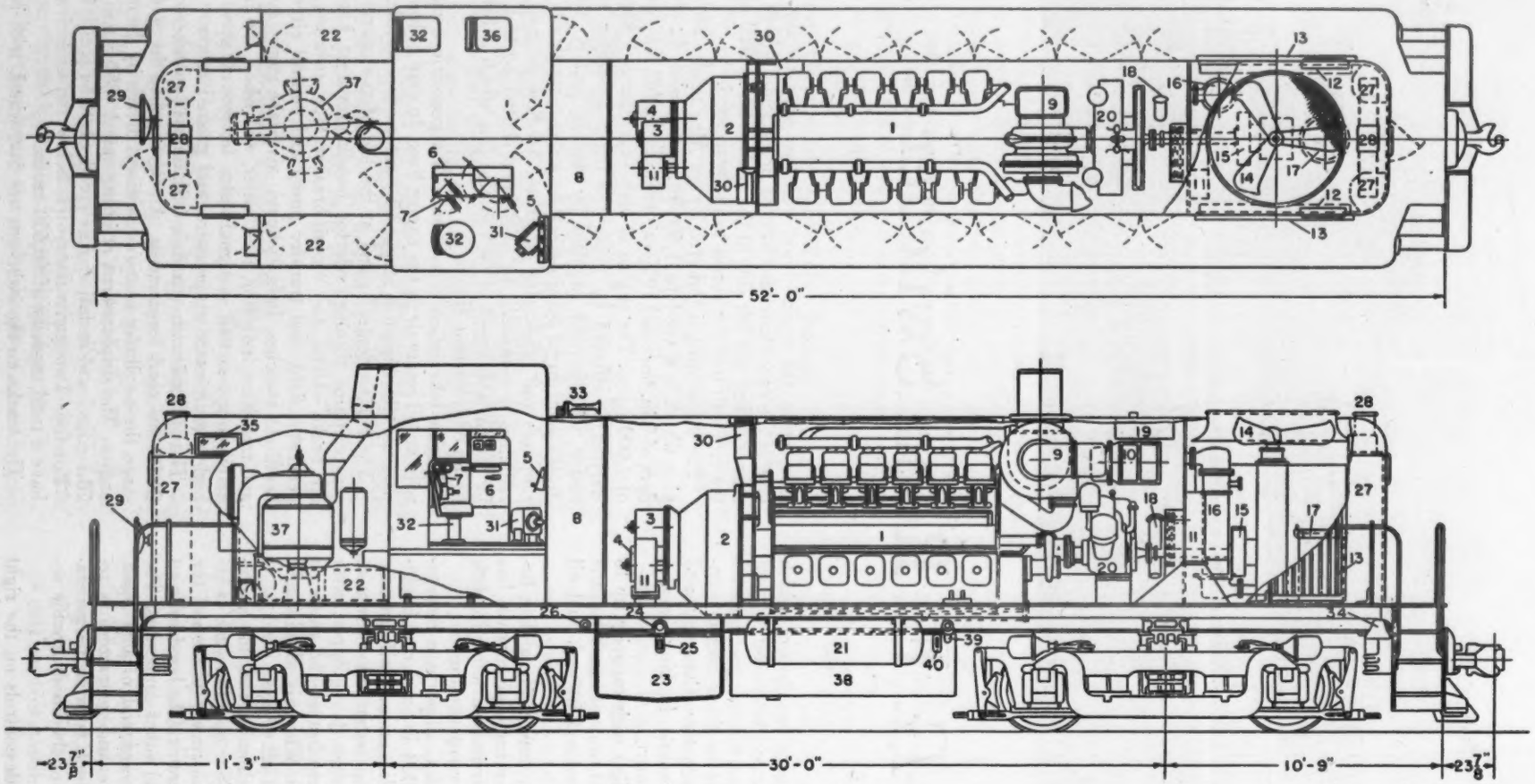
The locomotive is powered by an Alco model 244 engine which is a vee-type 1,600-hp. unit having 12 cylinders of 9-in. bore and 10½-in. stroke and a full-load speed of 1,000 r.p.m. The engine is turbosupercharged. Engine starting is effected by using the main generator as a motor, with current supplied by storage battery. Gear-driven centrifugal pumps circulate water through engine, radiators and lubricating oil filters. Air flow through the radiators is controlled by modulated shutter control and by the variable speed of the radiator fan, which is driven by an eddy-current clutch.

Engine lubrication is by means of a gear-driven pump with an oil reservoir in the engine base. In case of low oil pressure, the engine is stopped by automatic controls.

The engine control stand at the left of the operator's seat contains throttle, selector handle, reverser handle, air brake valves, and circuit-breaker type switches for generator field, fuel transfer pump and control circuits, headlight switches, light switches, air-brake gages, speed and transition indicator, load meter, and wheel slip indicating lamp, as well as signal lights for low oil pressure, high engine water temperature, and ground relays.

The air brakes are schedule 6-SL on road-switchers and 24-RL on road locomotives. Air is supplied by a two-stage, three-cylinder compressor direct driven by the main engine. The displacement at idling speed (350 r.p.m) is 78.7 c.f.m. and at full engine speed (1,000 r.p.m.) it is 225 c.f.m. Two main reservoirs, below the underframe, have a total capacity of 60,650 cu. in.

The trucks on the switchers are four-wheel, with clasp



1—Engine
2—Main Generator
3—Exciter
4—Auxiliary Generator
5—Gauge Panel
6—Control Stand
7—Brake Valves
8—Control Compartment
9—Turbo Supercharger
10—Turbo Supercharger Filters and Silencers
11—Traction Motor Blowers
12—Radiators
13—Radiator Shutters
14—Radiator Fan
15—Radiator Fan Clutch
16—Lubricating Oil Cooler
17—Lubricating Oil Filters
18—Lubricating Oil Strainer
19—Engine Water Tank
20—Air Compressor
21—Main Air Reservoir
22—Batteries
23—Fuel Tank
24—Fuel Tank Filling Connection
25—Fuel Tank Gauge
26—Emergency Fuel Cut Off
27—Sand Boxes
28—Sand Box Cover
29—Hand Brake
30—Generator Air Ducts
31—Cab Heater
32—Cab Seats
33—Horn
34—Bell
35—Number Boxes
36—Cab Seat
37—Steam Generator
38—Water Tank
39—Water Tank Filling Connection
40—Water Tank Gauge

Elevation and plan showing location of equipment on Alco-G.E. 1,600-hp. road switcher

brakes and are of the swing-motion swivel type with pedestals. The axles have 6½-in. by 12-in. journals and the rolled-steel wheels are 40 in. diameter. The motors are supported by the axles to which they are geared by spring nose suspensions on truck transoms. Plain steel side bearings and swivel-limiting devices are used.

Where six-wheel trucks are used for road passenger service, they are of the swivel, swing-motion type, with cast-steel pedestals. The trucks are arranged for application of two motors per truck, one to each end axle. The frames of these trucks are spring supported on equalizers with coil and snubber springs between center and end axles. The journals are 6½ in. by 12 in. There are two 12-in. by 10-in. brake cylinders per truck.

The regular locomotive eqipment consists of cab heaters, window wipers, warning signals, 12-in. bell with air ringer, fire extinguisher, sanders, sand boxes and extension lights.

The traction-motor gearing may be 68:15, 74:18 or 65:18 with continuous tractive force ranging from 46,000 lb. to 58,000 lb. and speeds of from 60 to 75 m.p.h.

All electrical equipment is supplied by the General Electric Company. The main generator (Type GT-581) is directly connected to the Diesel engine. The exciter is mounted on the end of the main generator. Mounted on the main generator is an amplidyne machine designed for use with the power plant regulator. There is also an auxiliary generator mounted on the end of the main generator which is gear-driven from the main generator shaft. It supplies power for battery charging, lighting and control circuits and operates at constant voltage under control of a regulator.

The traction motors are four-pole, d.c. machines designed for operation with full or shunted field. The manufacturer calls attention to the fact that the motor is almost self protecting, since in many cases it allows operation up to the point of locomotive wheel slip without entering the range of short-time restrictions. New insulating materials used in the motor have increased the continuous current rating from 900 to 1,085 amp.

GENERAL CHARACTERISTICS OF ALCO-G.E. 1,600-HP. ROAD-SWITCHER

Builders' model number	RS-3
Class—AAR designation	B-B
Track gage, ft.-in.	4-8½
Diesel engine—one, vee-type, 12 cylinders, turbosupercharged, hp.	1,600
Height (maximum), ft.-in.	14-5⅛
Width (maximum), ft.-in.	10-0¼
Length (inside knuckles), ft.-in.	55-11¾
Tractive force, continuous, 65:18 gearing, lb.	46,000
Tractive force, continuous, 74:18 gearing, lb.	52,500
Wheel base:	
Each truck (rigid), ft.-in.	9-4
Total locomotive, ft.-in.	39-4
Wheels, drivers—4 pairs, in., diameter	40
Truck curvature:	
With train, deg.	21
Minimum radius, locomotive alone, ft.	150
Weights:	
On driving wheels, lb.	240,000
Total locomotive, lb.	240,000
Supplies, Total capacity:	
Lubricating oil, gal.	200
Fuel oil, gal.	800
Engine cooling water, gal.	250
Sand, cu. ft.	28

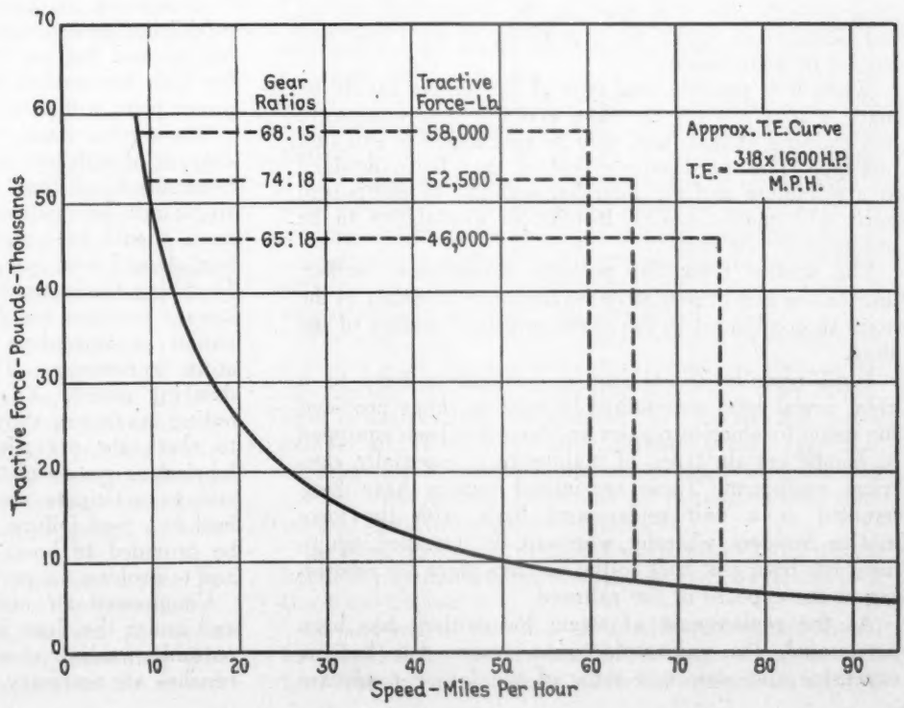
The motors are supported by the axles to which they are geared and by spring nose suspensions from the truck transoms. Wheel and axle assemblies are removable with the motors. Forced ventilation is obtained through flexible connections between ducts in the underframe and the motor frames.

The radiator fan, placed in an opening in the roof, is of the aphonic type, 60 in. in diameter of welded structure, designed to operate efficiently with varying speeds. In the fan drive, there is an eddy-current clutch. This is placed between the engine and the right-angle drive gear box from which the vertical fan shaft is driven. Slip of the clutch is electrically controlled and is coordinated with the radiator shutter control.

The power-plant regulating system modulates the Diesel engine loading by controlling fuel to the Diesel engine and adjusting generator demand. It holds constant any present engine speed by limiting engine torque and adjusting generator demand to the ability of the engine to deliver power at any moment and for any set speed.

Type P, single-end, single-unit control is used. Re-

(*Continued on page 515*)



Speed-tractive-force curve

Design for a Small Shop

A suggested layout for a Diesel servicing shop on a small road in which car repair work must also be taken care of

By J. C. Allenhurst

WHILE the railroads had few Diesel-electric locomotives, much of the overhaul work could be done by returning component parts to the builder to be replaced by a properly rebuilt part.

As the number of Diesel-electric units has increased, it has been found that the unit replacement method of overhaul is economically unsound and repair shops can be built exclusively for Diesel-electric maintenance designed and equipped to handle all of the repair work on the railroad.

The shop described here for a small road is designed to maintain and service all locomotives at one location and handle car repairs as well. This is not practical on railroads where the line extends over great distances but it has been found that, when possible, this consolidation of shop facilities may produce a higher level of maintenance and can avoid the duplication of facilities that are essential at repair points.

This complete maintenance method can be justified by experience. Particularly in the case of electrical equipment overhaul which has been an important item of expense and which require skills and tools that are not normal to steam locomotive maintenance requirements. There is no logical reason why these skills and equipment needs may not be developed and applied on most railroads which operate 25 or more units of Diesel-electric motive power. A lesser number of units may not justify the capital investment involved to provide proper facilities, though this will have to be determined on an individual basis under the conditions of each case and cannot be generalized.

When it is possible, one type of locomotive should be made a standard for the shop and the shop equipment and training of personnel may be specialized to suit that one type. The spare parts inventory may be maintained at a minimum and the interchangeability of component parts will enable a high locomotive availability to be produced by the shop.

The service track for periodic inspections, fueling, lubrication and preventative maintenance is placed in the main shop adjacent to the engine overhaul section of the shop.

Until recently Diesel-electric locomotives have to a great extent been maintained in existing shops provided for steam locomotive repairs and have not been equipped to handle certain types of maintenance, especially electrical equipment. These specialized repairs have been handled on a unit replacement basis with the locomotive builders whereby worn-out or damaged equipment has been sent back to the builders plant for rebuilding at the expense of the railroad.

As the replacement of steam locomotives has been accelerated, the unit replacement system has become expensive and slow and some of the larger roads are planning facilities to care for a larger part of their own work.

Service Track in Main Shop

The service, inspection and periodic maintenance may be improved by having this work done on a service track in the main shop. All of the skills necessary to the operation of the main shops will be readily available for emergency repairs that may arise, the complete shop equipment is at the disposal of the service crew and replacement parts are on hand in the main shop storehouse. This will eliminate the necessity of make-shift repairs such as is often the case when servicing tracks are some distance from the main shops.

The wheel, axle and truck overhauls may be done by the same facilities provided for the car maintenance by establishing the wheel and axle shop adjacent to the electrical repair shop so that as motors are removed from the truck for servicing the balance of the truck may be moved into the wheel and axle shop for overhaul by means of the same crane and table required to remove the truck from the locomotive and into the electric shop.

A common blacksmith, metal and pipe shop may be established at a centralized point to serve both the locomotive and the car repair shop. The air brake work for both locomotives and cars can be consolidated. One power plant will serve for all shops.

The service track, extending the length of the main shop, is of sufficient length to handle two complete road locomotives, of four units each, at one time or seven single-unit locomotives over the inspection pits. This track should have metering pumps for lubricating and fuel oil and with sufficient piping to provide six outlets for filling the locomotives. A water treatment plant with storage facilities for 2,000 gallons of treated water and outlets at convenient locations to fill locomotive radiators is necessary. This plant may also be used for drinking water. A small water and lubricating oil testing laboratory should be located at the service track to check the operating condition of the cooling and lubricating system of the engines as a maintenance guide and to anticipate conditions in the engine that may lead to a road failure. High-rate battery chargers should be provided to boost the locomotive starting batteries and to prolong the periods between battery overhauls.

Compressed air outlets should be located both over and under the floor level for cleaning purposes and a portable welding stand, small tools and several work benches are necessary along the service floor with small

tools and work benches under the floor. The underfloor space should be provided with several 50-ton jacks to assist in motor and truck repairs.

A pressure lubricating system is necessary with outlets at floor level and under the floor and an oil station under the floor for the servicing of journal boxes and repacking of the boxes is required.

A portable motor-generator set should be available to test and check electrical instruments, relays, fuses, and brakes in the locomotive. This set can be used in other shop locations when not required at the service stand.

A station near the exit end of the service track on the shop side will test the fuel injectors and governors for the entire shop but the location will make it convenient for checking the operation of this equipment in use on the locomotive with a minimum of delay. At the entrance end of the service track opposite the shop side the filter cleaning and maintenance point is placed to facilitate the changing of filters while the locomotive is being serviced and to remove this necessarily messy operation to a point that will not interfer with other shop operations.

Several portable platforms to bridge the service track. at regular intervals, between locomotives in process and an electric or hydraulic elevator to connect the floor level with the underfloor work space are necessary for the transportation of material and tools. Ample lighting and electric outlet plugs are necessary over and under the floor and in the pit between the tracks.

The pit between the tracks must be properly drained and facilities provided to collect oil or grease draining from under the locomotive. Platforms and spare brake shoes are also necessary in the pit.

A portable unit to flush radiators and oil coolers is needed on the floor level and a second portable unit to collect used crankcase oil and to flush the crankcase and lubricating oil system is required.

The tool and supply stock should include, in addition to necessary maintenance tools, a tachometer, pyrometer, megger, voltmeter and ammeter for inspection purposes.

The sand drier and sanding station should be placed outside of the entrance end of the service track to avoid heating the shop from the drier and to keep the sand away from the shop area. The locomotive, upon leaving the washer, will be sanded, then moved into the shop for inspection and servicing.

The Engine Maintenance Shop

The heavy engine maintenance shop is placed next to the servicing track where the tools and equipment are available for any major maintenance work that may be found necessary during the inspection and servicing. Replacement of many of the locomotive components such as lubricating oil pumps, injectors, filters may be done without delaying the locomotive.

Two repair stalls are available for stripping a locomotive for major repairs in an emergency the two truck stalls may be used for this purpose, but for normal operation two stalls should be sufficient for servicing up to a total of 20 locomotives through regular heavy repairs during a four-year cycle. This capacity can be materially increased, should it ever become necessary, through a complete shop unit replacement system, without further investment in shop equipment.

The repair stalls and the service track are served by an overhead crane of 30-ton capacity which is sufficient for the removal of the complete engine and generator assembly from the locomotive and by extending this crane into the wheel shops the trucks may be moved complete for overhaul. The extension through the main line side of the shop building to over a supply track will facilitate the movement of heavy supplies or equipment into the shop when it may become necessary.

A work shop and work space plus pits are provided under the floor level of the repair stalls to allow complete repairs and overhaul of the equipment on the underside of the locomotive such as full tanks, center pins and plates, brake piping, electric conduits, brake reservoir and draft gear. Hydrostatic test equipment is placed at this location to test the air brake reservoirs.

The area between the number one repair stall and the service track is designated as the engine test and assembly area. This location was chosen as that most convenient for reassembly of the engine to the locomotive and to keep the noise and heat that will be generated away from the general shop area. Engine test stands with the necessary equipment are placed here. The area between the number one and two repair stalls provides space for stripping the engine when it is removed from the locomotive and at this point an outside cleaning vat is used for the heavy parts of the engine before they are released for servicing. The space between the No. 2 repair stall and the first truck maintenance stall may be used for engine striping in an emergency. Engine cradles and heavy platforms are located here to assist in moving the large engine parts to the work space in the shop.

A degreasing and cleaning station is provided near the end of the number one repair stall for the cleaning of the small engine parts such as pistons, heads, injectors, pumps before they are released for servicing. Near the end of the number two repair stall the heavy welding point is established with screen and work places. This is a convenient location to service both the electric and engine repair shops with welding service beyond the capacity and accuracy of the portable welding sets.

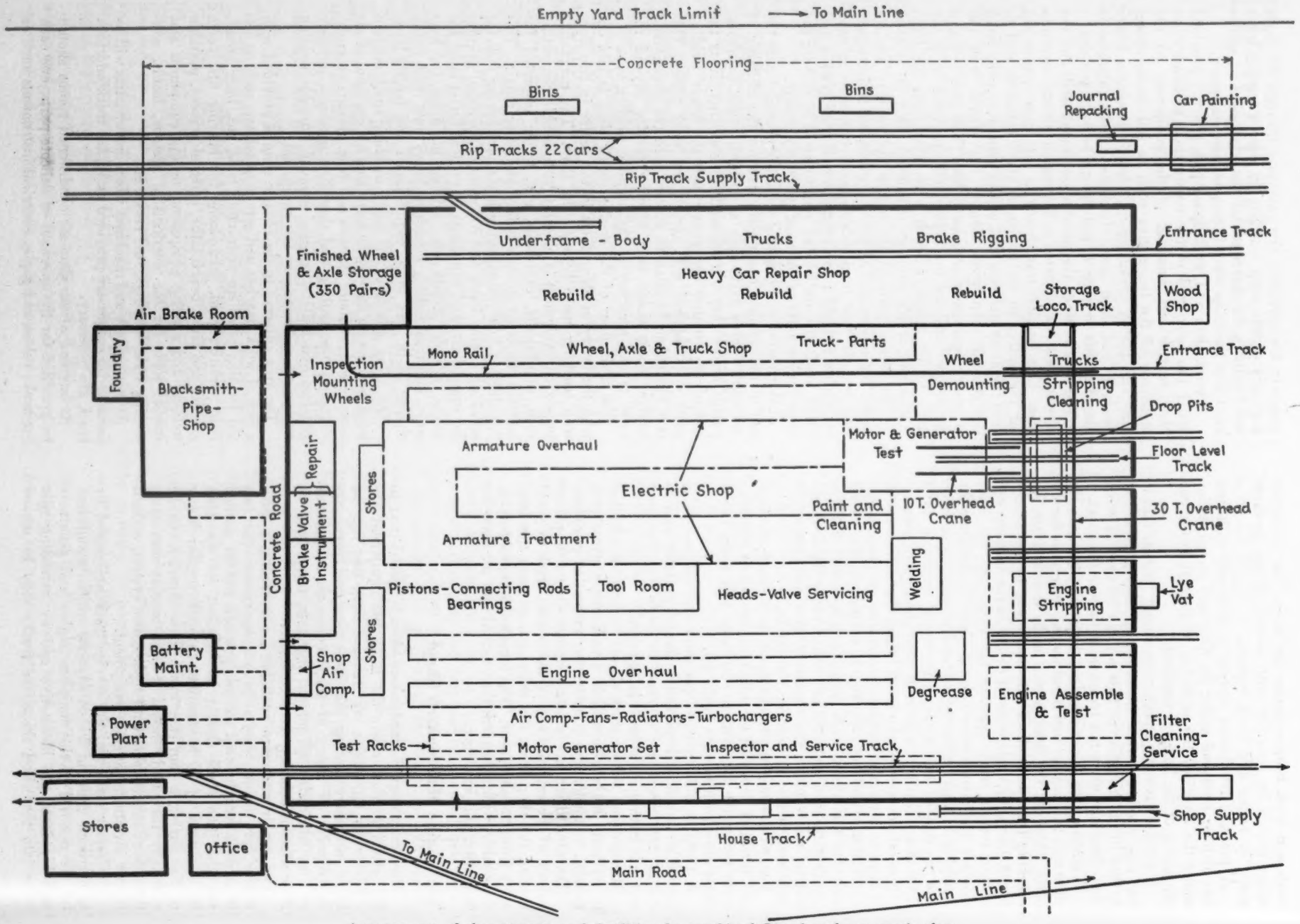
The main floor of the engine repair shop is laid out with the heavy machine tools in the center in two lines with trucking space between the lines. The magnaflux inspection equipment is placed first to enable connecting rods, crankshafts, camshafts, etc., to be inspected for internal cracks or stresses before and after repairs. This "production line" contains the horizontal boring mill for servicing engine bases and A-frames, a universal grinder for crankshafts and camshafts, a vertical turret lathe for boxes, cylinder heads, etc., milling machines for keyways, universal milling machines, heavy duty drill, crank shaper, 18-in. and 24-in. engine lathes and boring bars.

The areas outside of the heavy machine space contain work benches on the service track side for overhaul of air compressors, radiator shutters and fans, blowers or superchargers, pipe cutting and threading machine, portable grinders and buffers, pedestal grinder, portable welding equipment and necessary test equipment.

The area adjacent to the electric shop is provided with a line of work benches and service machines such as 50-ton bushing press for connecting rods, etc., liner honer, light sensitive drill, micro-hone for bearing fits, valve grinder and facer, bench lathe, pedestal grinder, portable welding and brazing equipment, testing equipment and special tools for the overhaul of pistons, heads, connecting rods, bearings, fuel racks, etc.

At work places and machines where heavy parts will be handled jib cranes are provided and a lift truck and fork truck are necessary.

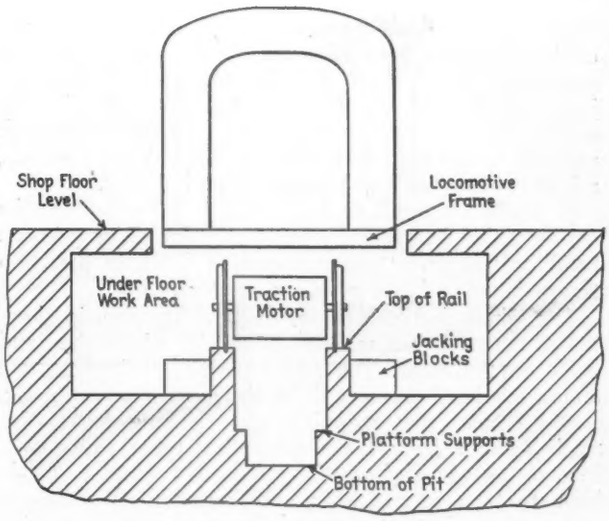
At one end of the shop air conditioned rooms should be provided for the overhaul of delicate parts, one each for brake valves and gages, electrical instruments such as



Arrangement of departments and facilities for combined Diesel and car repair shop

EQUIPMENT NEEDED FOR DIESEL AND CAR REPAIR SHOPS

	Approximate Cost (Dollars)
Engine test stand	7,000
Magnaflux inspection for crank shafts (2) (108-in.)	7,000
Horizontal boring milling and drilling machine	50,000
Universal grinder for crank shafts	40,000
42-in. vertical turret lathe	30,000
No. 5 universal milling machine	20,000
Vertical drill, heavy duty	15,000
Hydraulic shaper	28,000
18-in. engine lathe	10,000
24-in. engine lathe	18,000
¼-in. to 2-in. pipe threader	2,500
Motor-driven double floor grinder	900
50-ton bushing press	3,000
Liner honing machine	1,200
Sensitive drill	400
Valve grinder and facer	500
Bench lathe	1,500
300 amp. portable electric welding equipment	900
Heavy motor-generator set	800
Induction pinion heater	300
Armature band stripping lathe, 24-in.	12,000
500-ton press for removing armature shafts	12,000
54-in. by 6-ft. engine lathe	65,000
50-in. winding and forming lathe	8,000
Induction soldering machine	5,000
5-ft. radial drill, 17-in. column	18,000
Metal spraying equipment (for mounting on lathe)	700
30-in. engine lathe	20,000
Vacuum impregnator Dripping vat, Two tanks Baking oven, Electric	9,000
Dynamic balancing machine, large	7,400
Dynamic balancing machine, small	2,250
50-in. car wheel lathe	65,000
Car wheel boring mill	30,000
Axle centering machine	17,500
End-drive axle lathe, for locomotive axles	33,000
Magnaglow inspection equipment (axles)	4,000
Axle burnishing lathe	23,000
Journal truing lathe for mounted wheels	38,000
500-ton wheel press	12,000
Horizontal bulldozer	8,000
Light forging hammer, 500-lb.	5,000
Heavy forging hammer, 2,500-lb.	15,000
Gas shape-cutting machine	3,500
2-in. pipe threading machine	1,000
Metal cutting saw	400
48-in. punch and shear	10,000
4-ft. radial drill, 15-in. column	12,000
Annealing furnace	3,500
Pipe bending machine	5,000
Spring setting machine	4,000
Power hack saw	5,000
Hand forging equipment	3,500
Metal cleaning equipment	8,000
5-ton electric hoist and crane truck	10,000
2.5-ton jib cranes with electric hoist (11), each	2,500
Monorail for wheel shop	.....
500-lb. capacity electric babbit pot	2,000
Portable gas welding equipment	150
Pressure lubricating system	.....
Treating system for Diesel radiator water	12,000
Water and lubricating oil testing laboratory	3,500
Battery charger	2,500
Zyglo installation	1,800
Two 500 c.f.m. air compressors = 100-hp. motors	11,000
Air receiver for compressors, 42-in. by 120-in.	600
High pressure steam generator	2,000



Diagrammatic cross-section through work pits

meters, enclosed relays, transition indicators, alarm indicators, and a shop for the overhaul of governors, injectors, fuel, lubricating oil, water pumps and electro-pneumatic switches. There is space at this end of the shop to install air compressors of sufficient capacity to supply all of the shops with compressed air.

The Electric Shop

In the engine repair shop, placed to be available to the electric repair shop is space for a tool room and tool stores wherein cutters, drills, etc., are maintained and stored. Special jigs and fixtures, micrometer gages, tachometers, ammeters, etc., must also be stored here and maintained when possible. A general, open stores space is provided at the end of the engine and electric shop to supply daily requirements of material such as gaskets, bearings and caps, miscellaneous nuts, bolts, repaired small components, fuses, copper tubing, wire, nipples, couplings, etc.

The electric shop area should be enclosed with a light wire screen or fence to prevent unauthorized persons from wandering among the high voltage equipment.

The area at the shop end of the track pits is the motor and generator test area where the "hi-pot," megger test and heavy motor-generator set for running tests are located. A floor level track is placed running from between the truck removal tracks, over the drop pit table and into the electric shop. At this point, in the shop, a 10-ton overhead crane is provided to strip the motors from the truck before repairs and to assemble after repairs. The initial dismantling and final assembly of the motors and generators is done at this point as tests must be made before repairs begin as well as when they are completed.

The heavy machine tools are placed around the outer edges of the shop in the order of their use in the overhaul operation. An induction pinion heater is located for the removal of the motor pinions and roller bearings, a 24-in. armature band stripping lathe, 500-ton press for the removal of armature shafts then a magnetic flux testing station for shafts and pinion inspection before and after servicing. The following lathes will be required: 54-in. lathe for turning commutators: 50-in. winding and forming lathe; 24-in. armature banding lathe, induction soldering machine, commutator under-cutting machine and commutator stoning fixture.

The space at the end of the shop contains a boring mill, 30-in. engine lathe, 5-ft. radial drill, metal spraying equipment, brazing equipment, overhead cranes at work spaces and frame positioners. This is to maintain frames and field coils of the motors and generators.

The other side of the shop contains the equipment for varnishing and baking the armatures with first a vacuum impregnation, dipping vat, drain racks, baking oven, paint bench and finally a dynamic balancer. A cleaning-paint station is located at the end of the truck removal tracks to service motors and generators before overhaul and after.

The space between these two lines of heavy equipment is wide enough to allow lift trucks to operate and to locate work benches and light tools. The light equipment consists of storage racks for work in process and finished work, small electric oven, pedestal grinder, 50-ton arbor press, small armature winder, small dynamic

balancer, hand electric drills, reamers, and slotting tools, off hand grinders, portable electric welder, gas welding equipment, small lathe and the necessary small tools, jigs, fixtures and templates for the overhaul of small motors, exciters, voltage regulators, controllers and high and low voltage compartments with their circuit breakers, relays, magnet valves, contractors and wiring.

A power lift truck or fork truck is necessary for the movement of bulky components and dollies or portable handling equipment are required to facilitate the shop transportation of motors and generators.

The wheel and axle shop, next to the electric shop, is laid out to service wheels on one side of the shop and axles on the other. The first location serviced by the 30-ton overhead crane used for the locomotive stripping, contains space for stripping and cleaning locomotive trucks, followed by the dismounting press which will remove the wheels from the axle and a wheel and axle lathe to turn wheels while still mounted. A monorail system through the center of the shop equipped with axle tongs and wheel handling hooks, will facilitate the movement of wheels and axles from one work space to the next without an overhead crane.

On the wheel side of the shop is placed a boring mill, wheel lathe 50-in. (profile) and a wheel grinder. The axle side of the shop must have an axle centering machine and axle turning lathe for locomotive axles, a Magnanaglo inspection machine followed by axle centering machine, axle turning and burnishing lathe and a journal truing lathe for car axles and finally at the end of the shop, a wheel mounting press. Hi-lift jacks are necessary to handle wheel and axle assemblies while jib cranes, one-ton, axle racks and wheel dollies are required to handle work in process. Gas and electric welding equipment is an essential at the truck stripping location and a lift or fork truck equipped to handle wheels or axles and complete assemblies is important. The finished wheel and axle storage space is outside of the wheel mounting location and provides space for about 350 pairs of wheels ready for use on the rip track.

Heavy Car Repairs

The heavy car repair shop is provided to rebuild wrecked cars and to eventually overhaul and rebuild cars worn through service. Most of the side and end sheet cutting, pipe threading and cutting and forge work will be done to order in the shop provided for that purpose. The heavy repair shop will be equipped with cranes, welding equipment and heavy handling equipment not available to the rip track. The work in this shop is not expected to be heavy except for wrecks.

The rip tracks are expected to maintain the cars in all normal overhaul and repair work necessary in normal operation. The tracks are provided with twenty feet spacing between and concrete flooring all through for the use of lift trucks, portable cranes and dollies. The tracks proposed are sufficient to handle 22 cars at one time with ample space between the cars for work area. A supply track along side the shop is provided to allow the movement of heavy truck parts, wheels and axles and side sheets from the storage points to the cars under repair. This track can also admit the wreck crane if heavy lifting is required. Parts bins on the far side of the rip tracks are supplied with brasses, wedges, air brake hose, brake hangers, brake shoes, knuckles, springs, miscellaneous nuts and bolts and other small parts in every day demand. The exit end of the rip track is the location of an oil house where journal packing is made up and oil treated and tools are provided to properly pack the journal boxes of all cars leaving the rip track. Beyond the oil house a car painting shed is provided to assure all necessary parts of the car are properly covered with paint before the car returns to service. At this same end of the shop a small wood shop is located with a wood planer, band saw, rip saw, drill press and router to service the shops with any wood work that may be required and to do repairs to the interior of the locomotive cabs, windows and seats.

The blacksmith, metal, pipe shop is necessary to do heavy metal work that will be required on locomotives and cars such as frame repairs, side and end sheet cutting and forming, forging of brake rigging parts, steps, hand rails, truck bolsters, etc.

This shop, because of the heat incident to its operation, is separated from the main shop but centrally located to keep the transportation to any shop to a minimum. The foundry is located at this point. Concrete roadways for the small shop power trucks connect these shops with the main shop and the rip track.

The necessary heavy equipment for these shops include a horizontal bulldozer, a light and a heavy forging hammer, shape cutting machine (gas), threading and pipe cutter to 2-in., metal cutting saw, 48-in. punch, 4-ft. radial drill, drill press, annealing furnace, double-end pedestal grinder, grindstone, pipe bender, spring setter, hand forges complete, electric and gas welding equipment, machine hack saw, metal cleaning equipment (degreasing and sand blast), hoist and crane truck (electric), overhead 5-ton crane, jib cranes at work spaces, air brake equipment test racks, pipe storage racks and metal sheet storage racks. The foundry must have equipment for melting and casting bearing metals, brass, copper, and aluminum, reclaiming bins for metal scrap, grinders, wire brushes and buffers and a large furnace for heating iron and steel castings for welding.

Another separate shop is provided for battery maintenance of both locomotive and electric truck batteries. It is necessary to have this a separate, well ventilated shop because of the fumes that may be generated. This shop is enlarged enough to provide storage space and a small work shop for the maintaining of the electric shop trucks. Storage of electrolytics should be in this shop. Battery chargers are located here.

The shop power may be provided by Diesel generator sets, the Diesel engines of the same size and type as those used in the locomotive. This will reduce the spare parts to a minimum and offer superior maintenance procedures as it will fit in with the normal shop operation. The power plants are housed in a separate building to remove the annoyance of the high noise level and vibration that is a necessary part of such a power plant.

The general office may be located near the service track exit end of the shop to house the railroad dispatcher, radio equipment, if used, shop supervisors, and shop and stores records. The store house located behind the office is provided with a through track for the loading and unloading of heavy parts with the track paved to allow trucks to enter at the same point. This through track may continue on to the open storage space where rail, ties, wheels, axles, large sheet metal, spare trucks and other bulk equipment, that does not require protection from the weather, may be stored. This area should be sufficient to provide storage for salvageable scrap such as used wheels and axles and for heavily damaged rolling stock that may not be fit to operate until repaired.

A crawler crane for the heavy handling is necessary here.

A shop equipped as described, stocked with suitable spare parts should be completely self-sufficient for all major locomotive and car repairs or overhauls. All aspects of locomotive overhaul are within the scope of this shop except major crankshaft repairs or production. The capital investment necessary for complete crankshaft work is great enough and the normal crankshaft failures rare enough that spare crankshafts may be stored, for replacement when necessary and heavy repairs avoided.

Some Ways To Reduce Hot Boxes

(*Continued from page 497*)

the fillers and sizings render threads unfit for journal packing until they have been dissolved.

To arrest the movement of packing in the box, it is believed a square-bottomed box, ribs cast in the box and waste retainers accomplish the same purpose. If the journal could be kept in the original seat of the bearing during switching, humping, and braking, it would, for all practical purposes, effect the elimination of waste grabs and wipers. Contrary to popular belief, waste grabs are often preceded by an over-heated journal, the surface of which is sufficiently hot to repel the oil. A journal in such condition becomes sticky to waste fibers and pulls strings of waste out of the packing until sheared off or wadded up at the point of journal and bearing contact. These threads are usually of considerable length, yet when discovered along the edge of bearing or under it, are invariably called "short ends." Though all threads are long, a hot journal will pull them from the packing. A journal operating at normal temperature will not pull threads and seldom disturbs the packing.

In conclusion it may be said that the virtual elimination of hot boxes is dependent on the positive attitude and action of all concerned. The essential things to be done are enumerated in the table.

Alco-G. E. Road Switcher

(*Continued from page 509*)

versers and line contactors are electro-pneumatically operated. All other contactors are operated magnetically.

There are four traction-motor connections: series parallel full field, series parallel shunt field, parallel full field, and parallel shunt field. Manual transition of motor connections is used for the locomotives with four-wheel trucks; locomotives with six-wheel trucks used in passenger service are equipped with automatic transition. Manual, low-voltage switches, of the circuit-breaker type with reset feature, are used on auxiliary circuits wherever overload protection is required.

The contactor compartment which contains the electrical control equipment, includng the engine starting switch, is located at the rear of the hood. The apparatus is accessible through doors in the wall of the operating cab and through panels in the front partition. Louvers allow for adequate ventilation. Switches and meters are contained in a panel mounted on the compartment wall at the front of the operating cab where they are accessible to the operator in the cab. Dynamic braking equipment, when used, is installed in the rear compartment.

The storage battery is a 32-cell, 426-amp.-hr. lead-acid type. It is installed in two battery boxes, one on either side at the rear of the operator's cab, above the underframe, with 16 cells in each box. A receptacle provides connection for battery charging from an outside source.

All lights are connected to the storage battery through circuit breakers and light switches. There are lights in the operating cab on the ceiling, and on the gage panels. There are also lights in the engine, radiator and contactor compartments and receptacles for extension-light connections.

There is a headlight of the flush type with a 14-in. glass reflector at each end of the locomotive. Rack is fitted with 250-watt, 32-volt lamps, with dimming control.

Numeral boxes with electric lighting are applied on each side of the hood at each end of the locomotive. There are four step lights, one at each corner of the locomotive, and two ground lights, one under each side of the operating cab, all controlled by switches in the cab.

Each cab is equipped with an electric cab heater which may be either a 1.5- or a 2.5-kw. unit. There is an electric cooler for drinking water.

Lackawanna Diesel Shop

(*Continued from page 506*)

Electricians check traction motors, generators and renew brushes where and when needed, clean all creepage surfaces, inspect and clean all equipment in cabinets, check the automatic transition and cab signal equipment and make necessary repairs.

If a truck change is needed this is done at the Whiting drop table. Cooling fans, motors and dynamic brake grids and hatches are removed, repairs are made and parts replaced while the locomotive is on the ramp track where the overhead crane may be used for lifting.

All traction motors and journal boxes are checked for lateral. Axle liners and journal box snubbers are renewed if they have reached the wear limits. Steam generators are washed out when due and routine steam generator inspection and maintenance reports are handled. If it is necessary to make a major overhaul to a steam generator the generator unit and the tank are removed and replaced with a spare by overhead crane.

All tests and inspections required by the Interstate Commerce Commission are made when they are due.

Speed recorders are removed and calibrated, brakes and brake cylinders are checked, tire wear is taken and recorded and all defects found and reported by engine crews are repaired.

The interiors of car bodies and cabs are cleaned; door locks and sand box screens inspected and interior and exterior paint is touched up where necessary.

After all inspections, tests and repairs are made, the engines are started and thoroughly checked for leaks. A check is made to see that all injectors are firing; the air brake and signal equipment is tested; contactor and throttle sequences are made and the locomotive is again ready or service.

(Note: additional details of maintenance work in connection with general engine overhaul and the work of the electrical department will be the subject of articles in subsequent issues.—EDITOR.)

ELECTRICAL SECTION

Cleaning of Electrical Equipment

A variety of methods may be used, the choice depending in part on what the operator wants to do and how much he is willing to pay for equipment

By Don E. Stafford *

FOREIGN materials deposited on the surfaces of electrical equipment will result in lowered insulation resistance and lowered heat conductivity. This foreign material usually consists of dust particles in an oil film. The electrical conductivity of the film will depend upon the materials which compose the solid particles included in the film. Obviously, when reconditioning the equipment, which may include the installation of new windings, it is desirable to clean and remove these foreign material deposits from the surfaces of the motor or genefator. The method of cleaning to be used is usually influenced by the number and size of units to be cleaned, and is largely a matter of economics and capital outlay.

The several cleaning methods used are:

(1) Washing by hand with a suitable solvent or detergent, using rags and brushes.

(2) Pressure spraying with solvents.

(3) Pressure spraying with a steam jenny.

(4) Vapor phase degreasing.

(5) Pressure blasting with mildly abrasive materials.

(6) Combination of two or more of the above methods.

The first method cited is, of course, the most commonly used. It requires the least capital investment, and is adaptable to all sizes of equipment. It is necessarily used on large electrical machines which must be cleaned on location. Hand washing is also used for smaller electric motors, where the number of units to be serviced is too small to justify the installation of more elaborate equipment.

There are several solvents which may be used for hand cleaning. Cleaning naphtha is frequently used. This

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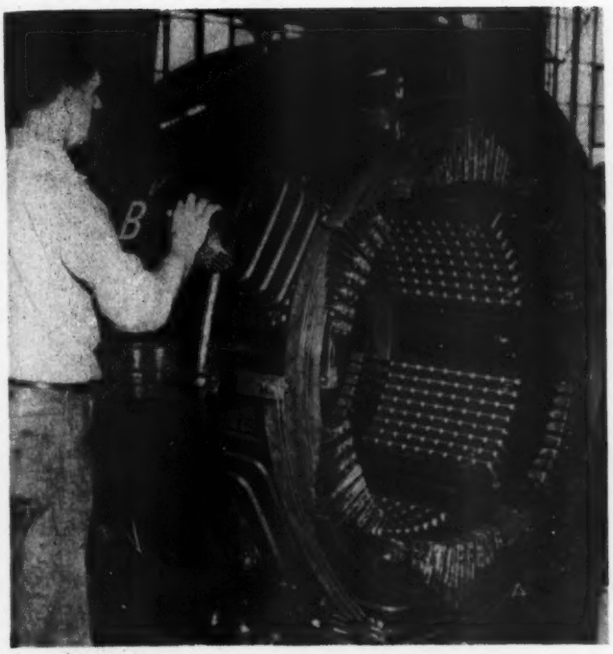
Cleaning a traction motor frame with the field coils in place, using a steam jenny—Deposits to be removed consist of oil and grease, plus dirt picked up in railway service



Hand washing a motor using rags soaked in a cleaning solvent—This operation should be performed in a well-ventilated area, away from open flames or electric sparks—Sealed metal containers should be provided for the clean rags as well as the dirty rags

solvent creates some fire hazard; therefore, where it is used, precautions should be taken. Some of these precautions are:

(1) Ample ventilation to remove vaporized fumes, which are heavier than air and will tend to settle to the floor level.

(2) The cleaning rags that are used should be kept in metal cans and away from combustible material.

(3) Open flames should be kept out of the vicinity in which the cleaning is being carried on.

(4) Electric sparks from battery-operated truck contactors, electric cranes, motor switches and commutators should be guarded against in the vicinity of the cleaning.

Stoddard's solvent, which is a mixture of cleaning naphtha and carbon tetrachloride, was developed to overcome the fire hazard of straight cleaning naphtha or solvent solutions, and is frequently used for hand cleaning. Carbon tetrachloride fumes are toxic and may produce headaches, nausea or fatigue in varying degrees. Ample ventilation should be provided where this solvent, or a mixture including it, is used.

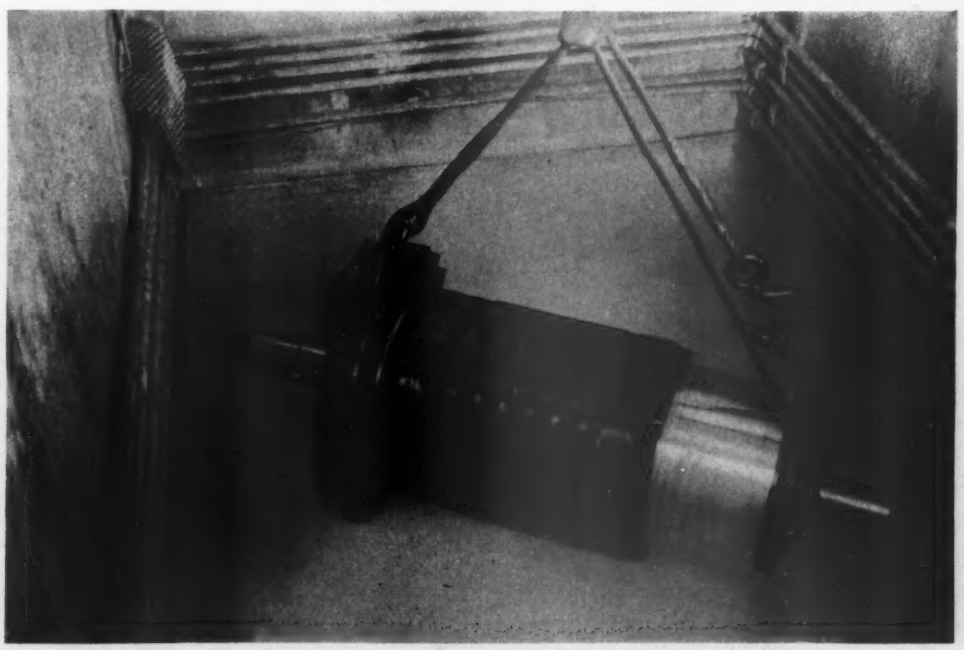
Other chlorinated solvents are also used for hand cleaning or washing, such as trichloroethylene. These solvents are also toxic to some extent, and the fume concentration should be held to a low point by good ventilation.

The E. I. Dupont de Nemours Company recently developed a cleaning mixture which has minimized the disadvantages in connection with petroleum solvent and chlorinated solvents. This is known as their Cleaning Mixture No. 49.

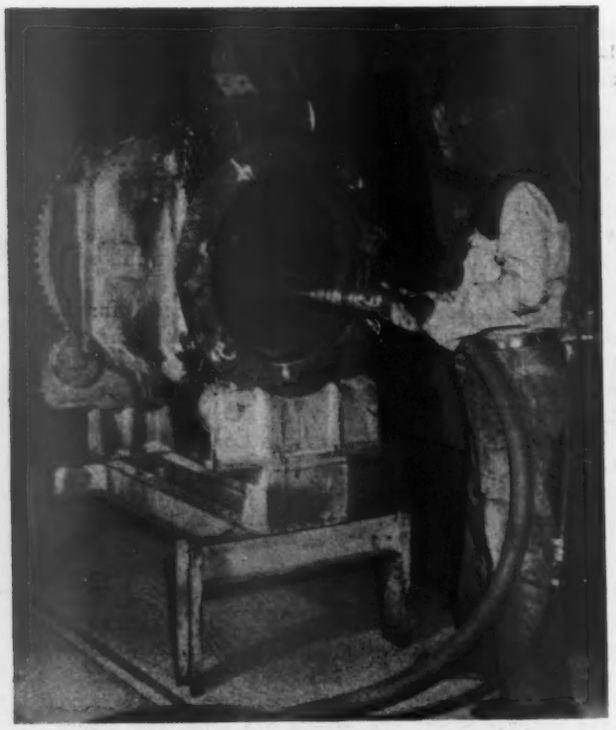
One factor which is common to almost all of the cleaning solvents cited is their effect on the human skin. They remove the natural oil from the skin. It is, therefore, good practice to wash the hands thoroughly with warm water and a good mild soap after they have been exposed to the solvents. Some persons are more strongly affected than others; where the effects are especially severe, it is advisable to follow the washing with an application of a lanolin base cream or lotion.

A hot water and detergent solution is sometimes used for washing electrical equipment. Such a solution is not as powerful as the solvents described previously and, therefore, the cleaning operation is not accomplished as rapidly. Following the washing with the detergent, the electrical apparatus should be thoroughly rinsed with warm water to remove any of the detergent solution suspensions. The detergents are not chemically neutral and may cause progressive deterioration of the insulation if they are not completely removed.

The second cleaning method involves the use of pressure spraying with a solvent solution. This air-pressure



Armature suspended in a vapor-phase degreasing tank for the removal of oil and grease—The cleaning vapor condenses on the part being cleaned and runs off as a vapor



Corn-cob air blast cleaning a direct-current motor frame with field coils in place—The motor frame has been previously made free of oily, greasy dirt deposits by subjection to a vapor degreasing cleaning cycle—The corn-cob blasting removes dried, curled paint films, and clears ventilating air passages—This cleaning cycle provides a clean base for the application of a new protective sealing insulating varnish coating, with the risk of contaminating the insulating varnish in container used for impregnation

spray washing is obviously a faster method than the hand brushing, or wiping, previously mentioned. The equipment required is relatively simple and of low cost. A light, homemade nozzle is often used, with a pickup hose leading to the solvent container and another hose to the source of air-pressure. A shallow pan may be used to catch the run-off solution, in the case of small and medium-sized pieces of equipment. The solvent used is a matter of choice and may be any of the cleaning solvents, such as those mentioned previously in connection with hand washing. The same safety precautions should, of course, prevail as mentioned in connection with these solvents.

A third cleaning method uses a steam jenny. The steam jenny relies upon the action of the hot steam, and its condensate, to do the cleaning jobs. Obviously, this is an improvement over hot-water hand washing. The steam and water vapor is, of course, not injurious to the insulation and the varnish film. Water and grease do not mix, which means that the cleaning action is not as rapid as the solvent spray method mentioned previously. With large pieces of equipment it may be necessary to supplement the steam jenny cleaning with hand cleaning for an effective overall job. The equipment required is the steam boiler, and with it, a heating source, water, and spray devices. Portable equipment utilizing an instant heating electric boiler is available, in addition to stationary types. The equipment expenditure for this type of cleaning will amount to a minimum of $300.

A comparatively new development in cleaning is the vapor phase degreaser. This method of cleaning has found wide acceptance within the last decade. Chlorinated solvents, such as trichloroethylene, with a boiling point of approximately 180 deg. F (82 deg. C), or perchlorethylene, with a boiling point of approximately 240 deg F. (116 deg. C.), are vaporized by heating in a suitable cleaning tank. The object or work piece to be cleaned is lowered into the vaporized solvent, which condenses on the surfaces of the cold work piece and runs off, carrying with it the dirt and grease. If the work piece is left in the hot vapor, it will attain the temperature of the vapor, at which time condensation ceases and the cleaning action stops. The hot trichlorethylene or perchlorethylene vapor will attack and damage or remove most paint and insulating varnish films, if the cleaning action is continued throughout the fall degreasing cycle (i.e., until the work piece reaches the solvent vapor temperature).

Vapor degreasing machines as used for batch-type cleaning of electrical equipment consist of a rectagular stainless steel tank, or a metal spray lined steel tank. Provision is made for the application of heat to the

(*Continued on page 529*)

Pressurized solvent spray cleaning an induction motor stator

As the last of the train goes over the hump, the locomotives supplies just the amount of power needed without going in and out of the idling position

Battery Field Resistor Smoothes Hump-Yard Operation

Texas and Pacific uses 1,000-hp. Diesel to handle 121 cars in saucer-shaped yard, and also maintains continuous tractive force with only a few cars moving slowly over the hump

THE Texas and Pacific has found it possible to use Electro-Motive, 1,000-hp. NW-2, eight-wheel (B-B), 62:15 gear ratio switching locomotive for pusher service in its retarder classification yard at Fort Worth, Tex. Two things have made the operation possible. One is the character of the yard, and the other consists of slight modifications of the locomotive controls.

The receiving yard is "saucer shaped." There is a dip in the center of the yard, so that with 120 cars in the yard, one end of the string is on the hump, and the other end is on an equivalent grade at the opposite end of the yard. Under these circumstances, at the start of the push, train resistance is only equal to that which would be encountered on level track with no hump. By the time the pusher locomotive has reached the center of the yard, it has lost the advantage of the downgrade, but by that time the train is only half length, and train resistance is reduced.

Humping speed in this yard is less than two miles an hour, and as the length of the train is further reduced, it is necessary for the engineman to periodically drop into the idling position of his throttle to keep train speed at the desired value. This means frequent operation of controls and control relays, and results in irregular power operation.

To avoid this condition, the battery field was reduced by the application of a 3.5 ohm, 800-watt variable resistor rheostat, which causes the engine speed to be increased to point beyond idle to perform the same amount of work and prevents the excessive operation of relays and contactors.

With the rheostat type resistor in the battery field circuit, the amount of tractive force at light load can be so controlled that the engineman may have any degree of tractive force necessary. He can so modulate the amount of tractive force that it is not necessary to drop into idling position unless the train movement is stopped altogether. This makes for very smooth operation.

When full power is required, as when the movement is being started, the engine is operated in normal manner by removal of the variable resistor from the circuit. The overall operation is, in addition, assisted by the improved wheel slip device, which energizes the over-riding solenoid in governor, which prevents the complete unloading of engine as normally would occur.

The largest train which has been handled in this service to date was one of 121 cars, weighing 5,110 tons. Operation of the traction motors at short time ratings for periods of several minutes is necessary, but no excessive motor temperatures have been reached, and periodical examination of the traction motors indicated normal operating condition to prevail.

Santa Fe Traction Motor Maintenance Practices

Fig. 2—A motor frame goes into the cleaning tank

Part I

THE Atchison, Topeka and Santa Fe is a pioneer in Diesel-electric locomotive operation, having started operation of road locomotives in 1936. Major electrical maintenance work required for Diesel-electric locomotives in service on the Santa Fe is performed at the railroad's electrical shop at San Bernardino, Calif. At the present time, about 120 traction motors per month are overhauled at this shop. Out of the 120, approximately 40 are rewound.

Evidence of the quality of the work done by the shop is given by the railroad's practice in using locomotives. Motors are given a general overhaul on a mileage basis. This mileage is 200,000 for freight locomotives used on western lines, 300,000 for passenger locomotives used on western and transcontinental lines, 300,000 for freight locomotives operating in central states, and 400,000 for passenger locomotives in central-state service. Switching locomotive motors are overhauled every four years.

No good shop is static. Methods and equipment must undergo almost constant change to meet new knowledge of requirements, to take advantage of new materials, to cope with changes caused by improved design and to reduce cost and improve quality of output. In the following are described some of the current practices employed by the Santa Fe's San Bernardino shop.

When motors are brought into the shop for general overhaul, they are disassembled and all loose dirt is blown out of both armature and field with compressed

Left: Fig. 3—Cutting off coils of arm preparatory to stripping—Note special air-driven saw—Right: Fig. 4—An armature in the Ruemlin shell blast cleaner—The cleaning tower is not shown

Methods and equipment used in the San Bernardino shops to obtain maximum services from traction motors were developed from experience with locomotives operating under a great variety of conditions

air. The ends of the armatures are cleaned with solvents, but solvents are not used on the windings. If the armature is very dirty, it is cleaned with a mixture of water and Kelite No. 24, which is applied with a special gun at 70 lb. pressure. This removes the carbon dust, heavy grease and dirt. It is next washed off with clear water and dried out in the oven.

The motor frames and field coils are cleaned in a similar manner, but first lowered into a tank containing a mixture of one-half Kelite 5-Star and one-half distillate, for one minute, to soften heavy grease and dirt. It is then removed from tank to turntable and washed with Kelite No. 24 mixed with hot water, followed up with rinsing off with clear water. If it is necessary to rewind an armature, bands are removed with a cutting torch. A circular metal saw, with special teeth is used to cut the coils close to the risers, and also to cut through the top coils near the brazed joints.

Fig. 5—Left: Micrometering an armature shaft—Right: Removing a brazed joint on a bad-order coil

Fig. 6—Line up table for aligning commutator bars and core slots

The armature is then removed to a stripping rack where an air hoist and come-along are used to lift out coils and wedges. Most of the mica and heavy pieces of insulation are removed by hand with a metal bar or tool.

After this operation, the armature is placed on a car and rolled into a Ruemlin blast-machine where all small particles of insulation or foreign material are removed in an air-driven blast of ground nut shells and fruit pits, known as 20-20 shell blast abrasive material. This effectively cleans the core slots without causing any deformation of the laminations. During this cleaning operation, the risers, commutator and V-rings are protected from the blast by shields made for this purpose. The blast machine includes a separator for removing dirt and finely broken or wornout abrasive from the useful abrasive.

A Schmidt natural-gas soldering torch with the iron removed produces a small pointed flame which is used to heat the risers for removing the coil ends after the coils are pulled out. As soon as the solder is soft, the coil ends are knocked out with a light hammer and drift.

Armature Shafts

All armature shafts are Magnafluxed in place, and checked with a micrometer for wear of fits. If the shaft is worn or has a flat spot, it is built up with metal spray and reground to specifications. A small amount of metal (about one or two thousandths of an inch) is removed from the shaft before spraying. This assures a complete and uniform surface of sprayed metal after regrinding and prevents the grinding from cutting through the sprayed metal at any point. All centers are straightened before grinding and spraying.

Core fits on the shaft are never built up. If the wear is more than .010 in., no attempt is made to build up with metal spray. Instead, a new shaft is applied. All fits are micrometered, and the large and small core quill fits of the shaft are turned to sizes which will assure an application pressure between 70 and 90 tons.

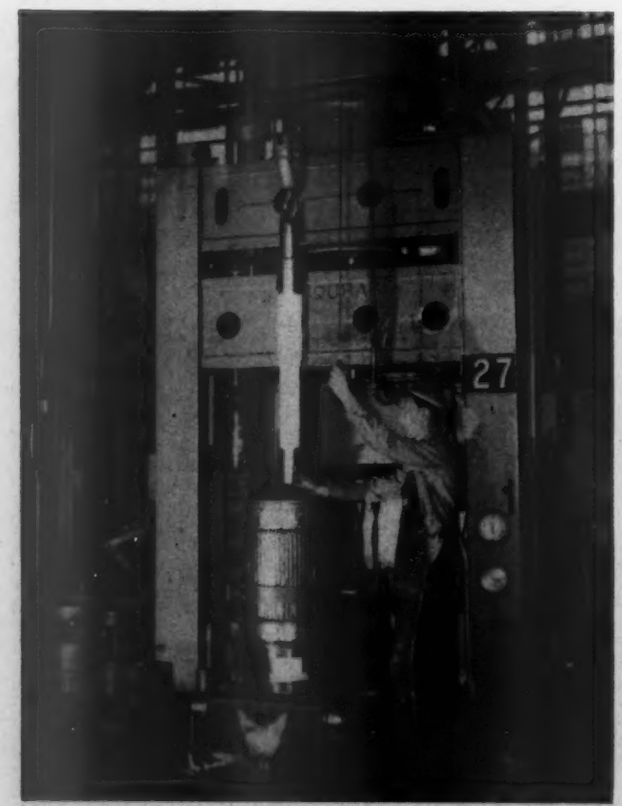
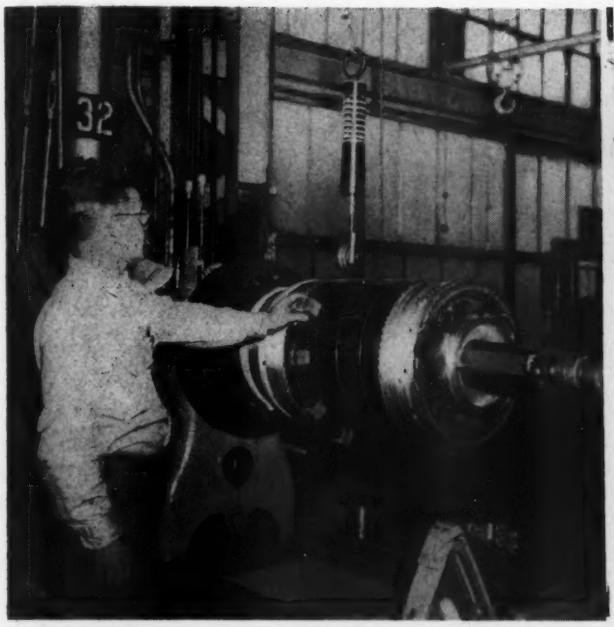


Fig. 7—The 250-ton Farquhar press being used for applying an armature shaft

Fig. 8—Winding section near the center of the shop



Left: Fig. 9—Rerolling bands on a Universal banding machine—Right: Fig. 10—A Type DA main generator being banded in a Globe armature machine

Alignment of Bars and Slots

For aligning coil slots and commutator bars, the commutator is first applied with a line-up bar as near as possible to its correct position and pushed on to about ¾ in. from its final position. A table micrometer is used for checking the alignment of commutator bars and core slots as shown in Fig. 6.

The table micrometer is first set to the height of the centers. A jig plate which just fits a core slot is then placed in the slot at the side which is at the same level as the centers. The micrometer is used to measure the height from the table to the underside of the jig plate, and is then moved over to measure the height from the table to the edge of a commutator bar. A thin wedge-shaped projection on the micrometer is placed in the undercut against the side of the commutator bar.

Measurements are made on every sixth core slot and compared with the corresponding commutator bar. All plus dimensions are added together and all minus dimensions are also added together. If the difference of the sums is more than .0015 in., the position of the commutator is corrected on the press, when the final pressing on is

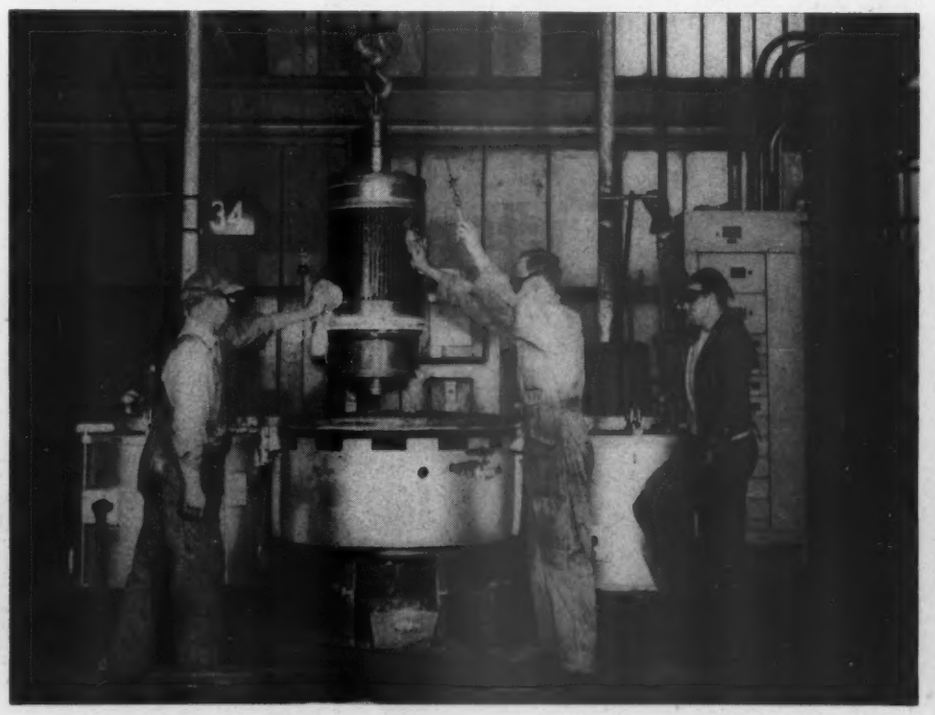


Fig. 11—A D-7 armature goes into the Steward pot soldering machine—It is now equipped with overhead air cylinders for controlling the level of the solder

Fig. 12—Ductor testing an armature—the cart is equipped with a motorized Megger tester, the Biddle Ductor and a rectifier for supplying current to the ductor

Fig. 14—Brazing the rear connections on a D7 armature in one of the two American Electric Fusion brazing machines

done. A turnbuckle on the press is used to move the commutator to the correct position, and this position is checked with a dial indicator.

Winding

When an armature is ready for rewinding, the risers are cleaned up and tinned by hand with a gas-fired soldering iron. It is then tested for shorts and grounds. Coil-support insulation is then applied and cross connections are layed. The armature is then heated in one of the ovens. After removal from the oven, protective metal shims are laid over the cross connections and this section of the armature is banded, and the bands rerolled at a wire tension of 300 to 350 lb.

After the armature has cooled, the temporary bands and shims are removed and insulation is applied over the cross connections. The bottom coils are then applied and the armature heated in a 300-deg. F. oven for 4 to 5 hours.

Temporary bands are then applied to the bottom coils and they are rerolled at 700 lb. tension. The armature is then again cooled and the bands removed.

Insulation is then placed over the bottom coils and the top coils placed. Metal sticks which project above the surface of the armature are placed in the slots over the coils for the complete length of the slots and temporary

Fig. 13—Armatures are given a high potential test with a Westinghouse Heavy-Duty H. P. Machine having a 15-kva. burnout transformer

bands run over the full length of the windings. These bands are rerolled at 750 lb. tension.

The armature is then removed from the banding machine and cooled, after which the bands are removed from the core section, but left on the coil ends.

Tests are then made for shorts and grounds and the wedges driven into place. After the wedges are in, the armature is again tested for grounds and shorts using a high-potential test at 2,600 volts and a bar-to-bar test at 220 volts.

The armature is then placed in a brazing machine and the pinion-end connections are brazed. After brazing, the pinion-end connections are insulated.

Tests are then made with a Biddle Ductor, (low-reading ohmmeter) and a split ring for protecting the mica at the rear coil support is applied. The armature is then put in an oven and heated for 10 to 12 hours at 300 deg. F. While still hot, the armature is removed for pot soldering of the riser connections.

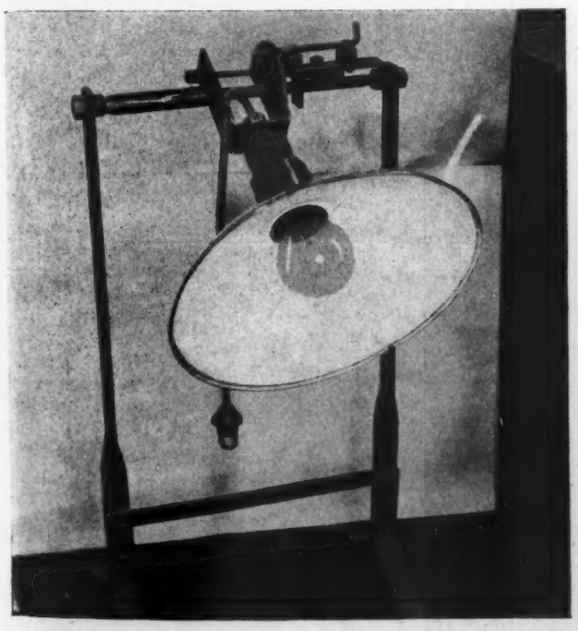
Part II will describe the Santa Fe's method of impregnating, baking and banding, overhaul of brush rigging, measuring and restoring bearing housing fits, and shop equipment required for traction motor maintenance.

Portable Light Stand

By W. E. Abbott

The portable light stand shown in the picture has been found to have many uses at the North Bergen, N. J., enginehouse of the New York Central. One particularly helpful application is its use on top of Diesel locomotives while removing or applying rocker housings and cylinder heads, or other work on a Diesel where the normal lighting does not give the light intensity required.

It is simple in construction, most of the details being shown in the illustration. A series of holes for engaging the pin at the top of the stand, makes it possible to swing the light through 180 deg. and lock it in any desired position.



The light is supplied with a short cord only, a portable extension being used to connect it to an outlet

It is used while cleaning drop pits, lighting up an area in a dark corner where light is not normally needed, and in many other places where a fixed light is needed, and a portable hand light does not give sufficient light for the work being done.

A similar portable stand is used at the ash pit also but the shade is in a fixed position in relation to the stand. This stand can be moved to best position for fire cleaners to see while cleaning out ash pans.

The area around the ash pit has the normal overhead lights but the poles on which the overhead lights are mounted are not located favorably for ground level lighting. The use of the portable light stand at the ash pit makes it safer to work there as water hose and other things on the ground can be seen when it is used.

Spray Cooling of Diesel Radiators

A METHOD of spray cooling Diesel-electric locomotive radiators, worked out by the Denver & Rio Grande Western, has effectively disposed of overheating in tunnels. The greatest difficulty was encountered in the Moffat Tunnel in which there is a 0.9 per cent grade eastbound from the west portal to the center of the tunnel. Train speeds in freight service in the tunnel are 14 m.p.h. and the need for extra cooling occurs particularly in the third and fourth units of the locomotives. These units must use air which has been heated by the first and second units. The temperature at face level in the four-unit engine room sometimes reaches 175 deg. F. with an ambient temperature of 62 deg. F.

A maximum temperature of 210 deg. F. has been measured in the radiator intake of the fourth unit. This is also aggravated by the fact that the engine intake air on the rear units has an oxygen deficiency which causes the engines to burn more fuel.

The situation was corrected by applying a water spray to the radiators of the rear units. Each unit is equipped with a 75-gal. tank for this purpose. When cooling is needed water is forced from tank by main-reservoir air pressure or is pumped by a rubber impeller type pump to three vertically mounted spray nozzles placed 14 in. below each radiator bank. The nozzles throw water in a conical spray at the rate of three gallons per minute maximum.

A solenoid valve is opened, or the pump is started automatically, when the engine temperature reaches a critical value. The control circuit is also carried through the control train line of the four-locomotive units. There is a manually operated switch in the cab which may be used to prevent loss of water which might occur when the spray is not needed.

A loop from the engine-jacket water is used to heat the cooling water in the 75-gal. tank. This was installed originally to prevent freezing. In practice, hot water has been found more effective in cooling than cold, since it evaporates quickly on the radiator. It thus uses the heat of vaporization, and is not lost by running off. The spray brings the engine operating temperature down to normal in about two minutes. The cooling arrangement was worked out by the Electro-Motive Division, of General Motors Corporation and P. F. Giesking, superintendent of Diesel equipment of the D. & R. G. W.

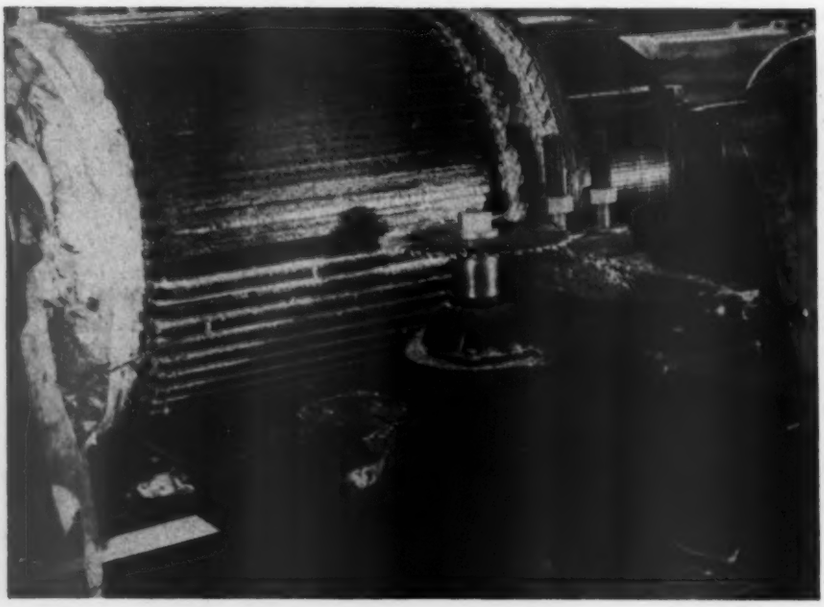


Fig. 1—The wedge cutter as mounted on a banding machine

Removing Traction Motor Armature Wedges

*By C. F. Steinbrink**

THE removing of armature wedges from traction motors that had to be rewound was not much of a problem with the motors used under our first Diesel locomotives. However, as the horsepower of the Diesel increased, and larger motors were installed, the temperature of the motor also increased, and something different than the conventional wedge material used at that time had to be designed.

At about this time glass cloth was being developed and, from experimenting with glass, our present-day wedge was finally developed. Although the present wedge is not glass, the material from which it is made, retains practically its full strength during the life of the motor.

The first wedges could easily be lifted or pried out with the coil when the armature was stripped, or they could be broken into pieces by a light hammer blow. The present wedges presented quite a problem since they had to be removed by driving them out of the slots. They did not drive very easily because of several layers of varnish and baked insulation sticking to the wedges, and their removal became quite a bottleneck in preparing armatures for rewinding.

After trying several methods that did not prove too successful, we eventually purchased a ⅓-hp. planetary gear reduction motor with a speed of 86 r.p.m., and mounted this motor on an old lathe cross slide and compound.

Figure 1 shows a close-up view of a motor mounted on a banding machine. We usually let five or six armatures accumulate so that we have a day's work ahead.

* General electrical foreman, Chicago, Rock Island & Pacific.

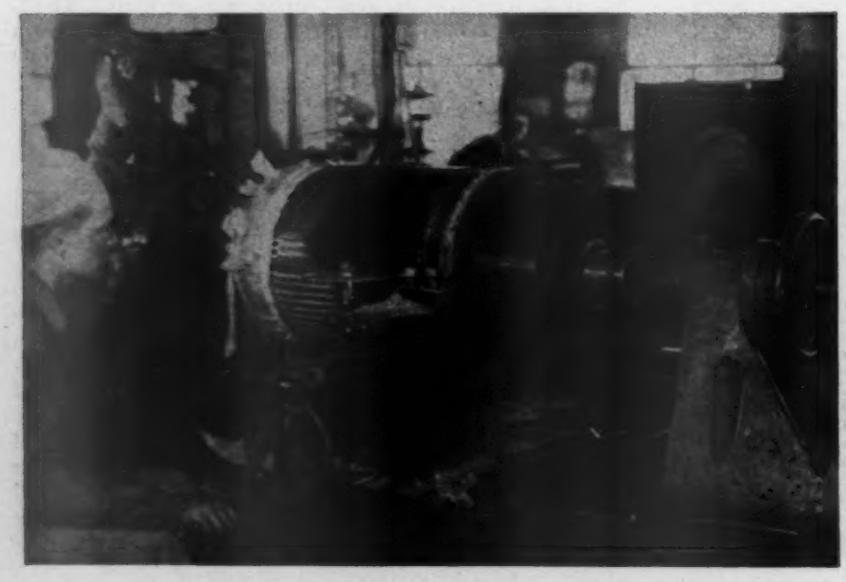


Fig. 2—The cutter will clear itself as fast as it can be fed by hand

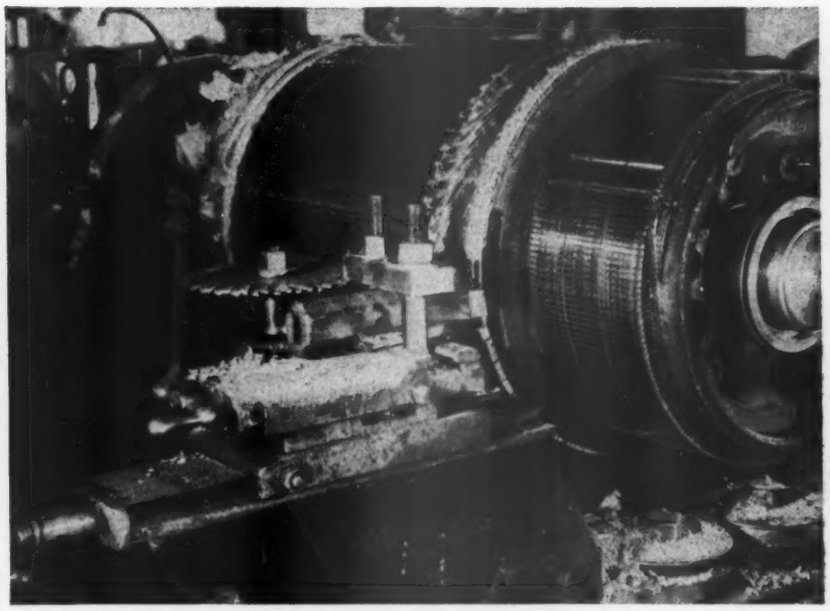
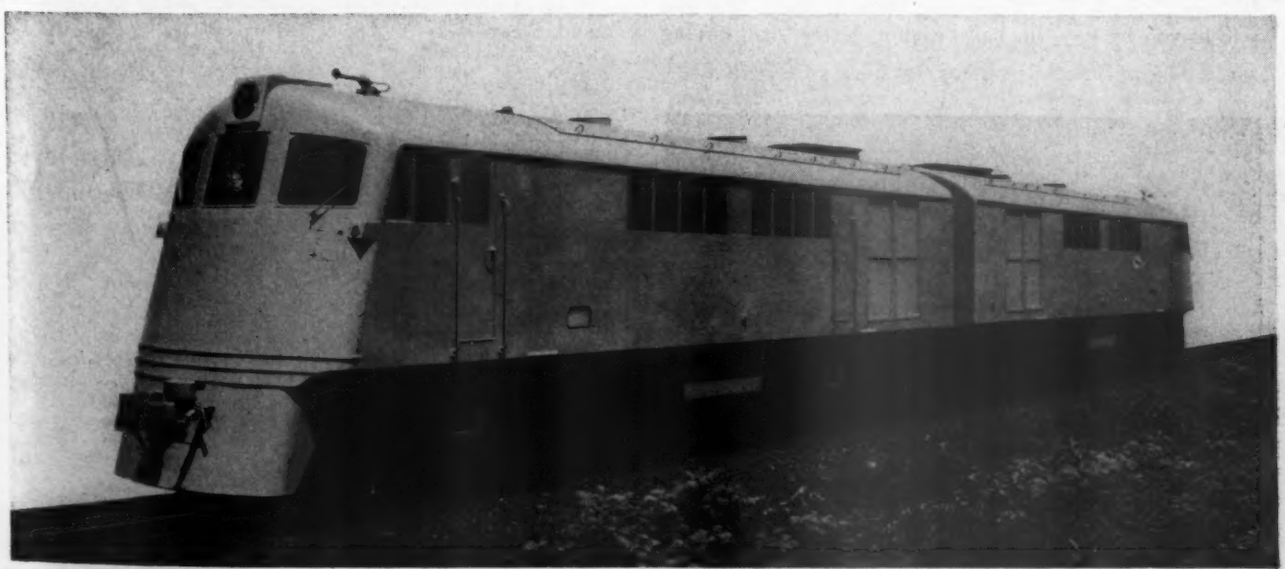


Fig. 3—A cutting tool mounted on the same head with the wedge cutter is used to cut the coils through at both the commutator and pinion ends of the motor

It takes about one-half hour each to apply and remove the bracket on which the motor and slide is mounted and another hour to clean the machine. As may be seen from the picture, it is rather a messy job. Although we have mounted the motor and slide on a banding machine, there is no reason why it could not be mounted on a lathe or any machine where the motor could be held between centers. The armature is indexed to align the slots with the cutter by a bar over the armature end ring. The cutter is an 8-in. diameter staggered tooth saw with side chip clearance and wide enough to give about $\frac{1}{16}$-in. clearance on each side of the slot. The width of the cutter is not too important as pieces of the wedge that are left in the slot will come out with the coil.

Figure 2 shows the mechanic with his left hand on the index bar, and his right hand on the cross feed. This cutter will clear itself as fast as it can be fed by hand, and takes just about one hour to cut out the wedge and cut the coils through at both the commutator and pinion ends of an armature.

Figure 3 shows a tool rest with a cutting off tool used to cut the bars loose behind the riser. This was an afterthought and not part of the original scheme. In the first set-up, the tool rest was not applied, but after the wedge cutter worked out so satisfactorily, we suggested that we use the tool rest for cutting off the bars. This had formerly been done in a lathe, and we now perform both operations with one set-up.



One of 35 meter-gauge, 2 unit, 1,800-hp. Diesel-electric locomotives purchased by the Argentine State Railways from the International General Electric Company—They have a 2 (A1A-A1A) wheel arrangement, a maximum speed of 56 m.p.h., weigh 330,000 lb. and will be used in both freight and passenger service

Left: One of the fasteners in place—Center: Ramset fastener tool, 22-caliber shell and fastener—Right: A pair of switches to a 7/16-in. column by four fasteners

Hanging Fixtures and Conduit on Concrete and Steel

St. Louis-San Francisco's new Diesel shop at Springfield, Mo., affords an example of excellent electrical work done in record time

CARBIDE-tipped drills for concrete and Ramset fastening tools for steel greatly facilitated the work of installing electrical equipment in the St. Louis-San Francisco's recently completed Diesel shop at Springfield, Mo. The shop is finished in dynamic color and neatness of appearance and permanence were stressed in the installation. The electrical work was performed by the railroad's own forces.

The location of all fixtures, switches and receptacles was first determined, and the location for fastenings scribed and prick-punched. Holes for fastenings in concrete were drilled with carbide-tipped drills made by the Willeys Carbide Tool Company, Detroit, Mich. The tool was driven by a ½-in. ball bearing electric drill having a no-load speed of 525 r.p.m. Holes were drilled to a depth of 1⅛-in., the depth of the hole being controlled by a piece of pipe placed over the drill. This acted as a stop when the drill reached the required depth.

The tool works best when sufficient pressure is applied to the drill. To obtain this pressure for drilling ceiling holes, the installers developed a rig shown in one of the illustrations. It consists of a lever supported by a horse and a work bench. Leverage is about 4 to 1 and a pair of cleats on the short end of the lever holds the handle of the drill and prevents its slipping off the lever. Drilling time for a hole is 10 seconds. The drilling of ceiling holes is done dry. Water is used for holes in side walls and floors.

The carbide-tipped drill in the chuck has been used to drill 200 holes without sharpening—The other is a new drill

A ½-in. electric drill with a no-load speed of 525 r.p.m. was used for drilling concrete

Operator setting a fastener in a steel angle

The fasteners used in the holes are ¼-20 lead anchors made by The Paine Company, Chicago.

Fastenings on steel columns and other steel surfaces were applied by means of a Ramset Fastening Tool, made by the Stemco Corporation, Rocky River, Ohio. The fastener used is cylindrical in form, having a ¼-20 thread at one end and a ⅛-in. ribbed or fluted section at the other, terminating in a hardened point. The fastener is placed in the gun with a special 22 caliber shell behind it. The pointed tip is then aligned with the location for the fastener and a light blow on the back of the hammer fires the shell. This drives the fastener into a 7/16-in. column so that the point projects slightly on the opposite side. Other loads are available if greater penetration is required.

Rig developed by installers for drilling holes in concrete ceilings

When either the lead anchor or Ramset fastener is used, it is only necessary to place the fixture or fitting over the projecting fastenings and secure them with ¼-20 nuts. Electricians who have labored with breast drill and star drill and hand hammer will particularly appreciate this procedure.

Cleaning of Electrical Equipment

(*Continued from page 518*)

bottom of the tank, utilizing gas burners, steam coils, or electric heaters. Located below the top of the tank, on the inside, are several turns of pipe through which cold water is circulated. This condensing coil controls the vapor cloud level and minimizes the solvent loss from spill-over and discharge to the atmosphere outside the tank. Some vapor degreasing machines are equipped with a storage tank to catch the distilled solvent which runs off the cooling water condenser coil. This storage tank feeds a pump and spray nozzle and is used to flush off heavy grease and dirt deposits. Initial degreasing machine cost will vary with size. A small tank, to accommodate up to 50-hp. motors, will cost under $1,000.

Another recent development in cleaning methods for electrical equipment is air blasting with a mildly abrasive material. One of the cheaper materials is ground corn cobs. Standard equipment, as designed for sand-blasting can be used for this cleaning process. The work to be cleaned is preferably first solvent cleaned in a vapor degreaser, or by the solvent spray method, or by hand washing and brushing, although the air blasting can be carried out without this pre-cleaning. This dry cleaning process has many advantages. The corn cob blast will remove the brittle dried varnish films along with dust deposits without damage to the electrical winding insulation or mica commutator insulation. No extraordinary care or attention is required to avoid damaging the coil taping or other insulation by the mild abrasive action of the corn cob blast. The cost of the capital equipment for air blast cleaning will vary with size. (Approximately $10,000 for an air blast chamber 8 ft. x 8 ft. x 10 ft., and associated equipment.)

Portable syphon blast equipment can be used to apply the corn cob dry cleaning method to large equipment on location. This offers lower initial investment, but the cleaning cost per piece may be greater than with stationary room or cabinet equipment.

General information on several cleaning methods and the machines or equipment for application is given in the preceding data. Definite procedures for rehabilitating electrical equipment during periodic inspection and overhaul should include the following operations:

(1) Clean as thoroughly as possible, using one or a combination of the methods cited.

(2) Bake out.

(3) Test.

(4) Impregnate in a good grade of insulating varnish, either by dipping or vacuum pressure process, and bake.

(5) Paint commutator risers, V ring surfaces after sand-papering smooth, brush holder enclosures and similar surfaces with a high grade air drying red commutator enamel.

(6) Final tests.

NEW DEVICES

Pneumatic Hand Tool for Applying Solderless Terminals

An air operated tool for crimping solderless terminals to wire in sizes from No. 6 to 1/0 has been developed by Aircraft-Marine Products, Inc., Harrisburg, Pa. It is designed to combine the advantages of a power press with the ease and flexibility of a hand tool. Specially featured are detachable heads for either the conventional side position crimping or "stub"

(end) position crimping. (A stub connection is used for closely positioned pig tail splices and requires end positioning of the tool when crimping.)

A suspension loop is attached to the top of the tool to enable it to be supported from above, and a double set of handles and triggers provide versatility of operation. When tool is supported, the operator uses the side handle, but when tool is being carried or lifted manually, as shown in the illustration, the top handle and trigger are usually more convenient.

A.M.P. pneumatic tools have previously covered the wire size range of No. 22 to No. 6, and the addition of this larger tool makes hand pneumatic installation now possible in A.W.G. wire range No. 22 to 1/0.

Air cylinder construction is of seamless tool steel with a safety factor of 300 per cent. Hardened toggle-action crimping jaws insure uniform pressures and a complete crimping cycle from standard shop outlets at 85 lb. per sq. in.

Hardfacing Brazing Alloy

A hardfacing alloy, Aircolite 59, has been added to the line of alloys by the Air Reduction Sales Co., a Division of Air Reduction Co., Inc., New York.

The new alloy, which has been on field trial for more than a year, is designed primarily for applications involving high stress abrasion with medium impact.

Cast in rod form, it is composed principally of chromium, molybdenum, carbon and iron. It has a low coefficient of friction, and therefore, acquires a high polish in service. The deposit maintains high hardness at temperatures up to 800 deg. F. The alloy is available in bare form or coated for electric application.

According to the manufacturer, Aircolite 59 is recommended for building up surfaces subject to high stress abrasion and metal-to-metal friction where impact is moderate and abrasion severe. It is suited to many applications in steel mills, foundries and metal working plants.

Composite Steel-Wood Freight Car Flooring

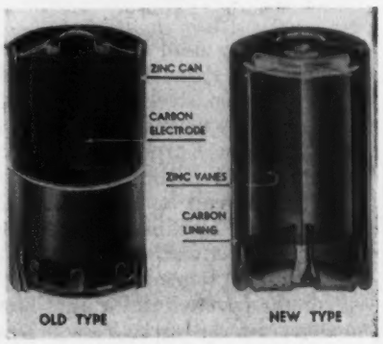
Illustrated is a type of freight car flooring which has been developed by the Armco Steel Corp., Middletown, Ohio. Combining the advantages of both steel and wood flooring, it offers lowered cost, greater strength and longer life for use in box cars, gondolas and flat cars.

Hat shaped steel ribs, placed across the width of the car and welded to the center sill, stringers, and side sill angles alternate with wood planks bolted to the rib flanges. The top surfaces of the hat sections form part of the floor. Since they extend slightly above the wood planks, they support most of the load and take the wear and tear of rough service. Steel planks, tack-welded to the ribs, are used where it is not possible to bolt wood planking.

The combination wood and steel floor has the advantages of both steel and wood flooring. Bulk lading can be mechanically unloaded without damage to the flooring, yet bracing can be nailed to the wood planks.

Especially important is the strength of the flooring. It will not sag under concentrated loads and will not break under the heavy loads imposed by lift trucks and palletized lading. Mechanical loading may exert wheel loads up to 10,000 lb. Since the steel ribs extend slightly above the alternate wood planks the steel surface takes most of the wear. Consequently, abrasion, splintering of the wood is reduced during rough service.

Flashlight Battery With Reversed Elements



The National Carbon Division, Union Carbide and Carbon Corporation, New York, has announced a new flashlight battery in which the container, formerly made of zinc, is now made of carbon, with a zinc vane as the center element. The old-type construction consisted of a zinc can container and a carbon rod center electrode.

Unlike the zinc container of the old cell, carbon is inert to electrolytic action and hence will never perforate when the battery becomes old or is discharged. The new cell has no metal can to leak or corrode, and the maker states it will not swell, stick or jam in the flashlight.

The service feature of the new No. 1050 flashlight cell of interest to the railroads is that it gives more light-minutes than any previous Eveready cell, providing more than double the usable light. Usable light is defined as the amount of brilliant white light available before the battery becomes too spent to produce light of useful efficiency.

The new battery is completely interchangeable with all D-size (standard flashlight size) batteries so that no change need be made in lamps or cases.

Flexible Insulating Varnish

A varnish that stays flexible after baking, making it valuable for impregnating transformer and similar coils, has been developed by the Irvington Varnish & Insulator Co., Irvington, N. J. The leads can be bent and twisted after the varnish is cured without danger of the conductor breaking or the varnish cracking.

This product, known as No. 123 Varnish, is a clear insulating liquid with good bonding characteristics, high dielectric strength and exceptional resistance to moisture, transformer oils, mineral oils and solvents.

Although it retains flexibility to permit leads to be bent into position, the varnish penetrates deep into the coil windings and bakes throughout to form a unified, solidly bonded mass. The product also exhibits stable characteristics in the impregnating tank as well as in storage.

Quick Action Machinist Vise

A new quick action, machinist's vice, built on a new principle and embodying a patented fast slide action, has just been announced by the Dodge Manufacturing Corporation of Mishawaka, Indiana. The product, known as the Dodge Slide-Set Vise, is available through established distributors.

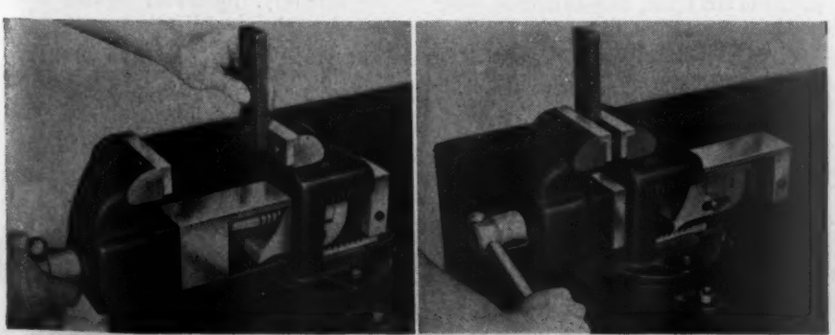
The vise opens or closes to any position in one second through a push-pull action which eliminates spinning the handle. It weighs 58 lb. and combines the ruggedness and full power of a conventional type vise with an instant slide action that speeds production, reduces operator fatigue and increases efficiency on bench and assembly operations.

The slide action is simple, fast, positive. A turn and a half of the handle counter-clockwise—and the jaw slides in neutral to any position. From the moment the work is engaged the vise operates in the conventional manner.

A specially designed no-pinch handle protects the operator against blood blisters between the thumb and forefinger.

The vise is provided with either a swivel or stationary base and is built in one size only: namely 4 inch. Each vise is individually packaged.

This vise is built, in the Dodge foundry and machine shop, of high-strength steel parts and semi-steel castings.



Left: Turning handle counter-clockwise throws vise into this neutral position —ready for fast slide action in either direction—Right: As jaws contact work a clockwise turn of the handle applies full pressure conventionally

Lamp for Bare-Bulb Fixtures

General Electric's Lamp Department has announced the development of a new type of incandescent electric light, which employs a unique shape and an enamel finish to form a combined light source and fixture in one unit.

To be made in the 50-watt size, the lamp achieves its improved performance by means of an attractive design, different from that of any previous lamp bulb. When viewed in its recommended base-up position, it looks somewhat like an inverted mushroom. It is three and one-half inches in diameter at the widest point. Because of the shape of the bulb, two-thirds of the lamp's light is directed upward giving an indirect lighting effect.

Screw Sockets With Carboloy Inserts

With the cooperation of the Carboloy Company, Inc., J. H. Williams & Co., Buffalo, N. Y., has developed a line of impact "Supersockets" for driving case-hardened, self-tapping screws with power tools of all types. They may also be used with hand drivers.

Due to the hard case found on screws of the self-tapping type, even the best

alloy steels, properly hardened, do not offer sufficient life. The screw drive opening in these impact Supersockets is formed of solid Carboloy permanently inserted into a hardened steel blank. The life, due to the Carboloy surfaces which drive the screw, is said to be at least ten times that of all-steel sockets.

Two sockets are now available in ¼ in. square drive with ¼ in. and 5/16 in. nominal hexagon openings. Both sockets fit hex, hex washer and oval hex washer heads. The finish is satin nickel.

Standard Carbon Brushes

A new method of merchandising carbon brushes is announced by National Carbon Division, Union Carbide and Carbon Corporation, New York, in the establishment of National Carbon Standard Brushes. This is being done to insure not only a better product, at a better selling price, but also an adequate stock at all times for prompt shipment.

The standard brushes in the list include some of the most popular items for Diesel-electric locomotive service; P.C.C. car motors; Westinghouse SK motors and generators, Westinghouse motors and generators having tandem holders; and General Electric CD motors and generators.

The standard brushes, to be sold at a flat price, are those in such demand that

they can be produced in large quantities, packed in standard packages, at the same price per brush regardless of the quantity purchased, provided they are purchased in standard package quantities or multiples thereof. The standard packages, in lots of 50, 100 and 250 brushes dependent on type of brush, are designed for convenient handling in stores and shipment.

Grades, shunt connections and other specifications for each brush, have been studied to provide the most satisfactory general performance, the widest latitude of application and the lowest consistent selling price.

Silicone-Insulated A.C. Welder

A silicone-insulated, portable, a.c. welding known as the 6WK20H series has been announced by the Welding Divisions of the General Electric Company's Apparatus Department.

Compact construction—12-in. by 17 in. in cross section, and 23 in. in height—permits its utilization of underbench and balcony space not available to larger welding units. It weight 154 lb., has a current range from 30 to 250 amp., and accommodates electrodes from 1/16 to 3/16 in. in diameter.

The standard model contains a primary switch and is designed for operation on 220 volts. Models are available for operation on 440 volts with or without power factor capacitors.

The automatic "hot start" control—composed of a hermetically sealed, gas-filled, time-delay magnetic switch and a wound resistor—causes a surge of increased current to flow through the welding leads. This surge is present only during the critical starting period, and its degree is considerably higher at very low "hard to start" currents than at higher "easier to start" current settings. Automatic reduction of boost at higher current settings avoids drawing current surges from the power line. It is of simple construction to give trouble-free operation, for it has no delicate relays, rectifiers, or fuses, and is not affected by dust.

Coils of the welder are impregnated with Class H insulation, characterized by the use of asbestos, glass, and mica, impregnated by synthetic high temperature-resisting resins known as silicones.

Alternating Current Industrial Arc Welder

The Fleetwelder, manufactured by The Lincoln Electric Co., Cleveland, Ohio, is a 200 ampere unit at 30 volts, 50 per cent duty cycle, and is suitable for production welding, maintenance, sheet metal, foundries and structural fabricators. It provides a wide current range of 30 to 250 amperes.

Arc stability results from independent reactance control, low electrical losses in the copper and insulation between laminations. This stability at low currents, permits the welding of thin sheets that formerly could be welded only with d.c. welders.

Once set, the welding currents stay set. The holding mechanism is independent of the adjusting mechanism.

Arc striking difficulties have been eliminated by the "arc booster." The instant the electrode touches the work, an extra burst of welding current is supplied which blasts the end of the electrode and instantaneously starts the arc.

Open circuit voltages never exceed 62 volts which eliminates the dangers of high open circuit voltages. Wheels are provided for portability at no extra cost.

Heavy Duty Engine Lathe

A new 25 in. heavy-duty engine lathe, completely redesigned for more power, accuracy and economical operation, has been announced by The R. K. LeBlond Machine Tool Co., Cincinnati, Ohio. The unit, known as the 1950 Series, boast a 30½ in swing capacity, 32 spindle speeds ranging from 5 to 602 r.p.m., four-directional power rapid traverse, totally enclosed quick change box, hardened and ground steel bed ways, and automatic lubrication throughout headstock, quick change box and apron.

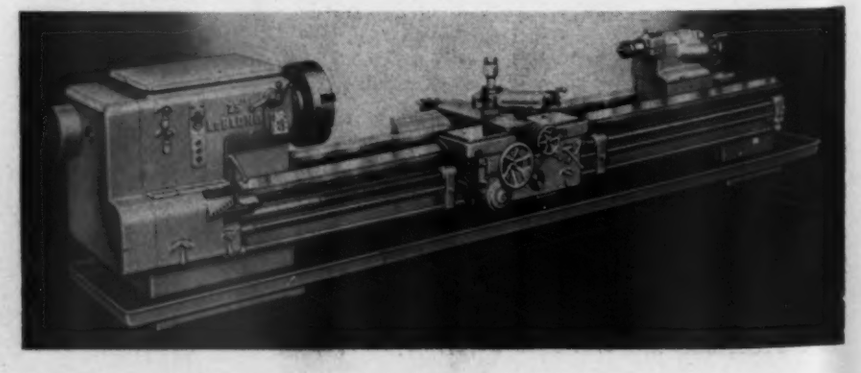
Gears not actually in use are cut out of the train, thus leaving more of the main drive horsepower free for machining. A four-bearing spindle mounting contributes further to smooth performance. The lathe is arranged for 25, 30 or 40 hp., 1,200 r.p.m. main drive motor as required.

Forty-eight feeds and threads may be selected from the totally enclosed quick change box. Standard thread range is ¾ to 46, and an optional range of ⅜ to 23 is also available. Replaceable hardened and ground steel bed ways front and rear are furnished. The unit may be furnished in a plain bed gap model with a swing capacity of 45¾ in.

Bench Type Drill Grinder

This self-contained machine produces the Sellers drill point on one or any quantity of drills in sizes as small as 0.028 in. (No. 70) and up to ½ in. in diameter. It provides theoretically correct drill lips ground with the same inclination to the

drill's axis, of equal length and with proper clearance at both the center and the periphery. Additional capacity is obtained with special attachments which

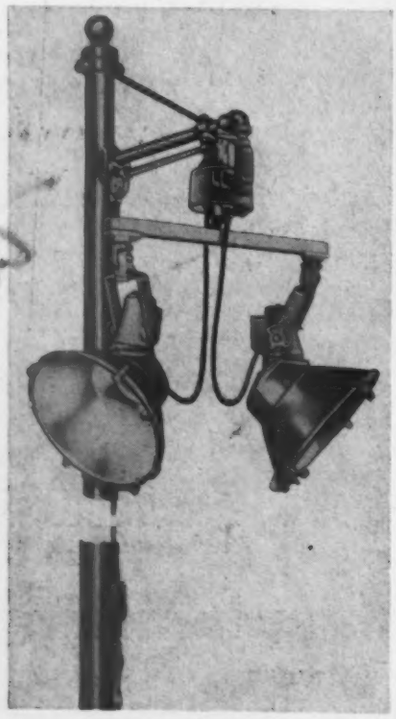


permits grinding drills from ½ to 1 in. in diameter.

The illustrated unit, known as the No. 1G Drill Grinder is a compact bench type grinder. It is available from the William Sellers Division of Consolidated Machine Tool Corp., Rochester, N. Y.

The device is equipped with a ball-bearing slide, ball-bearing swing frame and quick adjusting tail center providing increased accuracy, reduced wear and ease of operation. It is designed to provide every convenience to facilitate its use by either skilled or unskilled mechanics and to give a high degree production capacity.

Suspension Device for Twin Floodlights



The Thompson Electric Company, Cleveland, Ohio, has announced the development and availability of a new dual-floodlight suspension yoke which has been designed for use with outdoor models of Thompson disconnecting and lowering hangers. This device supports two bail-suspended floodlights from a single hanger, and consists of a special heavy-duty aluminum channel, two newly-developed aluminum alloy adjustable angle fittings, and two special 1-in. flanges with attaching cap screws.

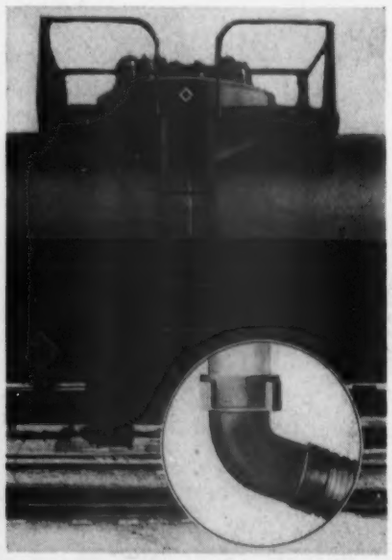
Floodlights of different types and weights can be utilized with the new suspension yoke and can be balanced easily by simple spacing adjustment on the channel.

The adjustable angle fittings permit balancing of lights in any vertical or radial position and provide for independent focal adjustment.

Component parts of both yoke assembly and the outdoor hanger are fabricated from corrosion resistant aluminum alloys to provide for long service life in all weather and atmospheric conditions.

Tank Car Unloading Coupling

Unloading of tank cars containing petroleum products or liquid chemicals will be less burdensome and faster by the use of



a nonferrous elbow coupling introduced by the Atlantic Metal Hose Co., Inc., New York 23.

This non-ferrous coupling is lighter than malleable iron couplings weighing only 4¾. This allows one man to affix the coupling and eliminates the use of heavy wrenches. In addition, the unit possesses high tensile strength and non-sparking qualities.

Hook-On Wattmeter

A hook-on wattmeter applicable to active and reactive power measurements in single and polyphase circuits has been announced by General Electric's Meter and Instrument Divisions.

Designated as Type AK-2, the meter enables measurements to be taken without service interruption. It makes use of a removable magnetic hook to surround the current carrying conductor, and potential leads are connected as in a conventional single-phase wattmeter. In addition, a three-phase balanced power measurement is made possible by the hook-on unit. This is accomplished by passing two power leads through the hook, and connecting the potential leads to these same two power leads.

The instrument is designed to meet exacting requirements as to accuracy, weight, simplicity of operation, and range of full scale capacities. Through the use of a single dial switch, a selection of any one of six power measurement ranges is available to provide readings from 3 to 300 kw. full-scale deflection.

The simple-switching, direct-reading scales of the wattmeter, introduced as a companion unit to the AK-1 hook-on voltmeter, have resulted in one hand operation with a minimum possibility of error in use. The new unit will be made available as a distributor item.

Constant-Voltage Megger Insulation Tester

A low-cost insulation resistance tester now being marketed by James G. Biddle Co., Philadelphia, Pa., offers all the advantages of the Midget Megger Tester, plus an im-

proved generator, flush terminals and durable, modern-design plastic case. In addition, it is available with ohm scale and selector switch in ranges 0 to 10 megohms (100 volts), 0 to 20 megohms (250 volts), and 0 to 50 megohms (500 volts).

Its most important uses include the diagnosis of trouble in all types of electrical equipment, including motors, generators, rotary converters, transformers, exciters, power cables and wiring, lighting circuits, control equipment and wiring

No other locomotive
has a Diesel engine
fully proved by
Two Billion unit miles
of railroad service

switchboards, appliances, electronic and communication equipment, radio and radar equipment, meters and relays, industrial heating units and furnaces, railway signaling, train control, car lighting and air conditioning, fire alarms, police telegraph and traffic signaling equipment, airplane and airport wiring and equipment.

Insulation resistance of electrical equipment is seldom, if ever, free from capacitance and dielectric effects, therefore the constant-voltage feature of this instrument becomes highly important as a source of steady d.c. test voltage. The slip clutch or centrifugal governor built into the driving mechanism permits cranking at varying speeds without effect on the voltage output of the instrument.

Precision Cylindrical Grinding Machines

The Landis Tool Co., Waynesboro, Pa., announces the new line of 10 and 12-in. plain and semi-automatic grinding machines. Among the many improvements is a heavy bed, new operating controls, new way-lubrication methods and new telescoping covers for the carriage ways. Lengths between centers of 18, 36, 48, 72, 96 and 120 in. are available in both the 10 and 12 in. swings.

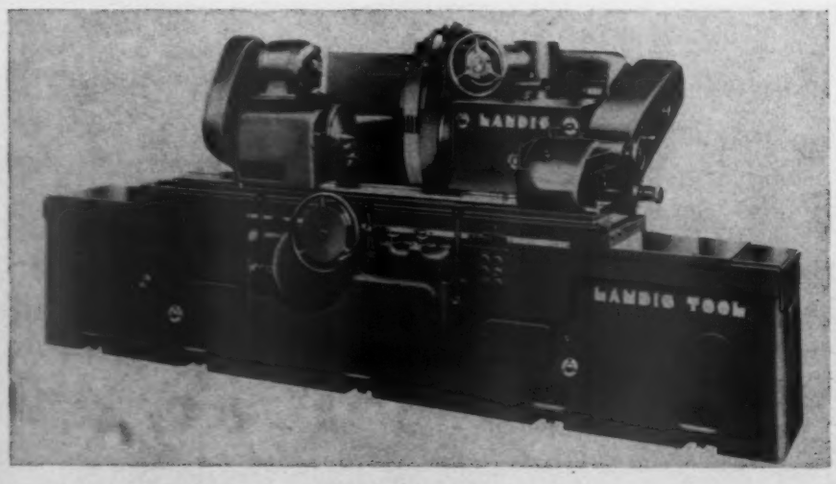
A 30-in. diameter grinder wheel is standard and is driven from either a 10 or 15 hp. motor, whichever is required. The headstock is powered by a 1 hp. motor with 4 work speeds from 54 to 150 r.p.m. Both wheel drives and complete headstock drives are through vee belts.

Microsphere bearings support the grinding wheel spindle. They are babbitt lined, steel backed, one-piece bearings and are adjustable for clearance between spindle and bearing.

The wheel-feed hand wheel can be operated as a coarse feed or fine feed. A hydraulically operated slow grinding feed for traverse grinding operations feeds at either reversal point. This feed is adjustable for both rate of feed and amount of feed. For semi-automatic plunge grinding operations, a timer may be supplied so that the operator will only have to load and unload the work pieces.

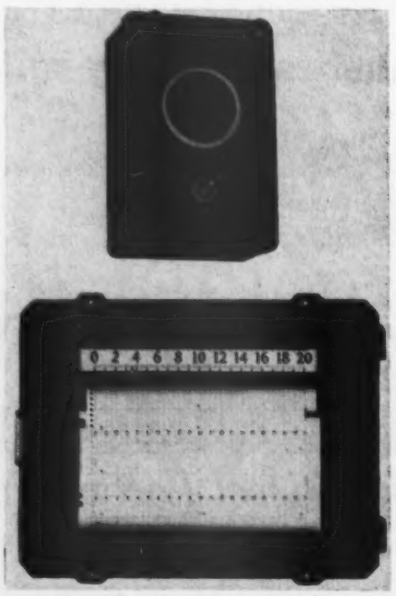
Telescoping covers are provided to protect the hand-scraped carriage ways. A swivel table permits the grinding of tapered work. Traverse speeds range from 3 to 120 in. per min. Tarry control for traverse grinding is variable and may be quickly adjusted at the front of the machine. The two speed hand traverse has a fast speed for set-up and a slow speed for hand traverse grinding up to shoulders if desired.

A variety of extra equipment is available, adapting the unit to special operations. This includes angular wheel heads, Landis-Solex automatic sizing, overhead wheel base mounted hydraulically operated wheel dresser and extra length hydraulic infeed.



Photoelectric Light Recorder

Rapid fluctuations in illumination intensity are accurately recorded by a new photoelectric light recorder introduced by the Western Electrical Instrument Corporation, Newark, N. J. Developed originally to chart the fast-changing light output of railway fusees, this new instrument also lends itself to many applications where wide variations in light intensity must be recorded faster than can be done by hand.



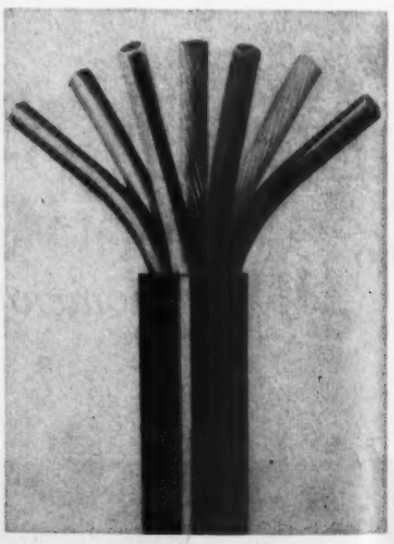
Though a new device, the recorder utilizes principles previously employed in other Weston and Tagliabue instruments. The sensing element, which can be placed wherever convenient, employs a "Photronic" photo-electric cell of the dry disk type made by Weston for more than 15 years. A built-in "Viscor" filter matches its color response to that of the human eye. Its "Celectray" recorder follows rapid changes without over-shooting or hunting.

Full scale values of 20, 40 or 80 foot-candles are selected by a single switch. The recorder can also measure candlepower of any value by proper adjustment of distance from the light source.

Non-Metallic Control Cable

A small diameter, 600-volt control cable which may be laid directly in acid or alkaline soils or installed where chemical fumes are present is now being made by Rockbestos Products Corporation, New Haven, Conn. The cables are made with from 1 to 12 conductors consisting of either No. 12 or No. 9 stranded tinned copper.

The No. 12 conductors are covered with 16½ mils of polyethylene and the No. 9



conductors have a 20 mil coating. This insulation has good dielectric qualities, is resistant to moisture and is flexible at low temperatures. It loses form stability at higher temperatures and swells in contact with oil. A 4-mil extrusion of nylon over the polyethylene keeps it in place and provides mechanical toughness and high resistance to oil. An outer extruded coating of Rockhide gives a tough covering which is chemically inert and highly resistant to ozone and sunlight.

Permanent color coding on the polyethylene under the nylon is made in accordance with N.E.M.A. standards.

(*New Devices continued on page 549*)

COULD be true, too. If we made up in one train all the railroad cars we actually ship from Wyandotte in a year it would contain over 21,000 hopper, tank and box cars. It would stretch from Detroit to Cleveland.

Actually, we're a lot more likely to ship those cars of Wyandotte products day by day . . . at an average of 60 cars a day.

But either way you look at it we're well acquainted with this nation's railroads. We buy from them . . . we sell to them. We think that the cleaners we make for railroad use show that we're well acquainted with your needs and problems. We think that a demonstration will be convincing. May we survey your cleaning operations with you?

THE WYANDOTTE LINE—*exterior and interior cleaning of passenger cars, Diesels and steam locomotives:* Raltec, Rillor, Rantier; ***steam and hot water pressure cleaning:*** Rantier, Rawtal, Altrex; ***vat cleaning:*** No. 11 Cleaner, Metal Cleaner X—**in fact, specialized cleaners and strippers for <u>every</u> cleaning need.**

Wyandotte Chemicals Corporation
Wyandotte, Michigan • Service Representatives in 88 Cities

NEWS

Prudential To Finance Leasing of GAEX-DF Cars

THE Prudential Insurance Company of America will finance construction and leasing to railroads of the new "GAEX-DF" box car developed by the General American-Evans Company, a subsidiary of the General American Transportation Corporation.

In making the announcement, Carroll M. Shanks, president of the Prudential, said there was sufficient traffic to keep 100,000 of the "damage-free" cars in profitable operation. Since it costs about $10,000 to build and put each car in service, the installation of 100,000 would involve a billion dollars of financing. Prudential would supply 80 per cent, or $800 million, while General American-Evans would supply the remaining 20 per cent, or $200 million.

Mr. Shanks explained that the financing would be under equipment-trust arrangements of the usual type. Prudential would purchase equipment trust certificates issued by General American-Evans and guaranteed by General American Transportation. He added that the certificates would perhaps have 20-yr. terms, i.e., mature in annual installments over 20-yr. periods.

Lester N. Selig, chairman of the board of General American Transportation, explained further that the arrangement under which railroads would use the cars would be a lease—not a purchase plan and that nine roads have already made arrangements to lease the cars—Boston & Maine; Chesapeake & Ohio; Chicago & North Western; Chicago, Burlington & Quincy; Gulf, Mobile & Ohio; New York, Chicago & St. Louis; Pennsylvania; Southern Pacific, and Wabash.

Increase of 122,000 Freight Cars Approved

A PROGRAM calling for a net increase in freight-car ownership of 122,000 units within the shortest possible time has been approved by the full membership of the Association of American Railroads. This program, perhaps the most comprehensive step the railroads as a whole have taken since the rehabilitation program of 1923, was approved by the 132-line membership at a special meeting in Chicago on July 28, with virtually all members present. Plans call for the following three-fold approach to the goal:

1—Monthly production of at least 10,000 new cars both by car builders and by the railroads themselves;

2—An extensive program of renovation and modernization of older cars in the present fleet; and

3—Immediate step-up of railroad repair programs to reduce the bad order figure

ORDERS AND INQUIRIES FOR NEW EQUIPMENT PLACED SINCE THE CLOSING OF THE AUGUST ISSUE

DIESEL-ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of Units*	*Horse-power*	*Service*	*Builder*
Chicago, Milwaukee, St. Paul & Pacific	5	1,200	Switch	Fairbanks-Morse
	5	1,200	Switch	Baldwin Loco. Wks.
	5	1,200	Switch	Alco-G.E.
Duluth South Shore & Atlantic	6[1]	1,600		Baldwin Loco Wks.
Kentucky & Indiana Terminal	5	1,200	Switch	Fairbanks-Morse
Louisville & Nashville	25A[2]	1,500 or 1,600	Switch	Electro-Motive
	16[3]	1,000 or 1,200	Switch	Electro-Motive
New York Central	6	1,200	Switch	Lima-Hamilton
	21	800	Switch	Lima-Hamilton
St. Louis-San Francisco	25	1,500	General purpose	Electro-Motive
	5	1,200	Switching	Electro-Motive
	4	1,200	Switching	Fairbanks-Morse
Seaboard Air Line	30[3]	1,500	Road switch	Electro-Motive
	20[3]	1,600	Road switch	Alco-G. E.
	6A[3]	2,250	Road passenger	Electro-Motive
	10[3]	1,000	Yard switch	Baldwin Loco. Wks.
Tennessee Coal, Iron & Railroad Co.	2	1,600	All service	Baldwin Loco. Wks.
	5	1,200	Switch	Baldwin Loco. Wks.
Youngstown Sheet & Tube Co.	3	750	Switch	Baldwin Loco. Wks.

DIESEL-ELECTRIC LOCOMOTIVE LEASES

Baltimore & Ohio	14[3]	1,600	Freight	Baldwin Loco. Wks.
	24[4]	1,000	Switch	Baldwin Loco. Wks.

ELECTRIC LOCOMOTIVE ORDERS

Road	*No. of locos.*	*Builder*
Chicago, Milwaukee, St. Paul & Pacific	12[3]	General Electric

FREIGHT-CAR ORDERS

Road	*No. of cars*	*Type of car*	*Builder*
Canadian Pacific	700[3]	50-ton box	National Steel Car Co
	300[3]	50-ton box	Eastern Car Co.
Chesapeake & Ohio	2,000[7]	70-ton hopper	American Car & Fdry.
	1,000[7]	70-ton hopper	Bethlehem Steel
	1,000[7]	50-ton box	Pullman-Standard
Chicago & Eastern Illinois	200	50-ton box	Company shops
	25	Covered hopper	Thrall Car Co.
Chicago, Milwaukee, St. Paul & Pacific	600[3]	Iceless refrigerator	Company shops
Chicago, Rock Island & Pacific	69[3]	70-ton covered hopper	American Car & Fdry.
Gulf, Mobile & Ohio	300[10]	Flat	Company shops
Lehigh Valley	300	70-ton gondola	Bethlehem Steel
New York Central	500[11]	Refrigerator	Despatch shops
	1,500[11]	55-ton box	Despatch shops
	500[11]	70-ton gondola	Despatch shops
	500[11]	70-ton hopper	Despatch shops
	1,000[11]	55-ton hopper	Despatch shops
	1,000[11]	Box	Pullman-Standard
	500[11]	70-ton gondola	Greenville Steel Car
	1[11]	Well-type flat	Greenville Steel Car
	500[11]	70-ton gondola	Bethlehem Steel
Pennsylvania	2,000[12]	Gondola	American Car & Fdry.
	1,000[12]	Gondola	Pullman-Standard
	750[12]	Gondola	General-American
	250[12]	Box	General-American
	1,000[12]	Box	Pressed Steel Car
Reading	1,000	50-ton hopper	Bethlehem Steel
St. Louis-San Francisco	500	Box (PS-1)	Pullman-Standard
Seaboard Air Line	500[13]	Box	Pullman-Standard
	200[13]	Covered hopper	Pullman-Standard
	100[13]	Covered phosphate rock	Pullman-Standard
	400[13]	Gondola	Bethlehem Steel
	25[13]	Caboose	Internat'l Car & Ry. Equip. Mfg. Co.
Southern Pacific	1,000	50-ton box	Pullman-Standard
Union Pacific	1,000	50-ton box	American Car & Fdry.
	1,000	Gondola	General American
	1,000	50-ton box	Company shops
	500	Flat	Company shops
Union Tank Car Co.	225[14]	Tank	Company shops

FREIGHT-CAR INQUIRIES

Atlantic Coast Line	300	70-ton covered hopper
Baltimore & Ohio	300	70-ton flat car underframes
Chicago, Indianapolis & Louisville	100	Box
	150	Open-top
Fruit Growers Express	1,000[15]	Refrigerator
New York Central	1,500	70-ton gondola
	1,500	55-ton hopper
	1,500	55-ton box
Reading	500	Gondola
Southern	2,050	50-ton box

[1] To be delivered within six months, completing Dieselization of the road.
[2] Deliveries expected to begin in October and to be completed by the end of the year.
[3] In addition to the 60 reported in the August issue. Deliveries to begin in October and to be completed by February, 1951.
[4] Six of the locomotives have already been delivered. The remainder are scheduled for delivery by November.

ANNOUNCING NEW "NATIONAL" STANDARDIZED BRUSHES

at a BETTER PRICE for a BETTER PRODUCT in a BETTER PACKAGE

Our years of standardization work boil down to this: you get the grade used originally, or a newly-developed superior grade, in a new, simplified method of carbon brush purchases. You make a substantial saving in ordering, billing, stocking and transportation.

HERE ARE A FEW OF THE BRUSH ITEMS YOU CAN NOW ORDER FROM STOCK:

TYPICAL APPLICATION	BRUSH No.	SIZE (Inches)	GRADE	Standard Package
● West. SK Motors & Generators	NC 12–3202	1¾ x 1 x ⅜	255	50
● GE CD Motor & Gen. (15/15°)	NC 12–4003	2 x 1¼ x ⅜	255	50
● Diesel-Elec. Loco. Main Gen. (30/30°)	NC 12–4819	2¼ x 1½ x ⅜	SA-35	100
● Diesel-Elec. Aux. Gen. & Blower	NC 16–3220	1¾ x 1 x ½	SA-3538	100
● West. Motors & Gen. (Tandem Holders)	NC 16–5603	2½ x 1¾ x .492	SA-35	100
● Diesel-Elec. Aux. Gen. & Blower	NC 20–3220	2 x 1 x ⅝	259	100
● Diesel-Elec. Main Generator	NC 20–4202	2 9/16 x 1 5/16 x ⅝ (5/16-5/16)	SA-3590	100
● P.C.C. Car Motors	NC 20–4810	2 x 1½ x ⅝ (5/16-5/16)	AX-5	100
● Diesel-Elec. Traction Motor	NC 20–6420	2⅛ x 2 x ⅝ (5/16-5/16)	AZY	100
● Diesel-Elec. Main Generator	NC 24–4024	2½ x 1¼ x ¾ (⅜-⅜)	255	100
● Diesel-Elec. Traction Motor	NC 24–5620	2 x 1¾ x ¾ (⅜-⅜)	AZY	100
● Diesel-Elec. Traction Motor	NC 24–7215	2 x 2¼ x ¾ (⅜-⅜)	AZY	100

Complete lists of standardized brushes supplied on request

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STANDARDIZED BRUSH NUMBER

[6] Delivery to begin late in November.
[8] For use in electrified territory between Harlowton, Mont., and Avery, Idaho. The locomotives were built for export to Russia but were not delivered due to international developments after the order was placed. They are designed to operate on 3,300 volts d.c., but will require certain modifications as to gage and coupler height before they can be placed in service. The Milwaukee will undertake the necessary modifications, and in addition, will equip at least two of the locomotives with steam generators to permit their use in passenger service.
[7] To be equipped with high-speed trucks. Deliveries to begin in November.
[8] Ultimate ownership of cars not yet settled.
[9] The Rock Island is also inquiring for material for the construction of 500 50-ton flat cars in its own shops.
[10] To be constructed from one-piece steel underframes purchased from the General Steel Castings Corporation.
[11] Five hundred of the refrigerator cars are for the Merchants Despatch Transportation Corp. The road also contemplates making arrangements to contract with car-building shops for complete reconstruction of 2,000 box cars and 2,000 gondolas.
[12] Deliveries expected to begin in January and to be completed in April. The road's heavy repair and reconditioning schedule covers 17,000 cars, which, beginning August 1, will come out of shop at the rate of 3,000 a month.
[13] First deliveries expected in December, with completion scheduled for the early part of 1951.
[14] To be equipped with welded steel tanks for transporting liquified petroleum gases.
[15] These are 40-ft. cars. The construction of 100 50-ft. steel refrigerator cars has also been authorized.

NOTES:

Missouri Pacific.—The Missouri Pacific has ordered a total of 100 one-piece cast-steel underframes for pulpwood cars.

Wabash.—The Wabash has announced a car-construction program calling for a total of 500 new 50-ton box cars, 300 will be 40½-ft.; cars with 8-ft. doors and 200 will be 50½-ft. cars with 14½-ft. doors. The company has ordered material for the construction of one depressed center car and has under consideration the acquisition of 100 mill-type gondola cars and 50 flat cars. Total cost of the 700 new box cars to be acquired by the Wabash and its subsidiaries, the Ann Arbor (which will purchase 100 50-ton, 40½-ft. cars) and the New Jersey, Indiana & Illinois (which will purchase 100 50-ton 50½-ft. box cars with 15-ft. doors) not including the gondolas or flat cars, is estimated at $6,400,000.

SELECTED MOTIVE POWER AND CAR PERFORMANCE STATISTICS

FREIGHT SERVICE (DATA FROM I.C.C. M-211 AND M-240)

Item No.		Month of April 1950	Month of April 1949	4 months ended with April 1950	4 months ended with April 1949
3	Road locomotive miles (000) (M-211):				
3-05	Total, steam	28,580	34,676	107,076	143,319
3-06	Total, Diesel-electric	16,678	11,780	63,549	44,742
3-07	Total, electric	858	857	3,193	3,385
3-04	Total, locomotive-miles	46,124	47,314	173,837	191,447
4	Car-miles (000,000) (M-211):				
4-03	Loaded, total	1,573	1,532	5,790	5,947
4-06	Empty, total	889	894	3,174	3,414
6	Gross ton-miles-cars, contents and cabooses (000,000) (M-211):				
6-01	Total in coal-burning steam locomotive trains	49,987	58,351	169,619	223,902
6-02	Total in oil-burning steam locomotive trains	10,563	14,074	43,367	59,118
6-03	Total in Diesel-electric locomotive trains	47,553	34,416	178,472	127,965
6-04	Total in electric locomotive trains	2,350	2,414	8,305	9,097
6-06	Total in all trains	110,493	109,262	399,845	420,106
10	Averages per train-mile (excluding light trains) (M-211):				
10-01	Locomotive-miles (principle and helper)	1.05	1.06	1.05	1.06
10-02	Loaded freight car-miles	38.00	36.50	37.10	35.10
10-03	Empty freight car-miles	21.50	21.30	20.40	20.10
10-04	Total freight car-miles (excluding caboose)	59.50	57.80	57.50	55.20
10-05	Gross ton-miles (excluding locomotive and tender)	2,671	2,603	2,566	2,477
10-06	Net ton-miles	1,201	1,196	1,147	1,129
12	Net ton-miles per loaded car-mile (M-211)	31.60	32.80	30.90	32.20
13	Car-mile ratios (M-211):				
13-03	Per cent loaded of total freight car-miles	63.90	63.20	64.60	63.50
14	Averages per train hour (M-211):				
14-01	Train miles	17.10	16.90	17.00	16.80
14-02	Gross ton-miles (excluding locomotive and tender)	45,044	43,370	43,027	40,990
14	Car-miles per freight car day (M-240):				
14-01	Serviceable	46.20	43.50	42.00	42.00
14-02	All	43.00	41.30	39.00	40.00
15	Average net ton-miles per freight car-day (M-240)	868	855	778	818
17	Per cent of home cars of total freight cars on the line (M-240)	43.70	50.80	47.50	49.50

PASSENGER SERVICE (DATA FROM I.C.C. M-213)

3	Road motive-power miles (000):				
3-05	Steam	11,939	16,026	44,537	68,375
3-06	Diesel-electric	14,217	12,318	55,859	46,607
3-07	Electric	1,609	1,666	6,364	6,794
3-04	Total	27,766	30,028	106,761	121,853
4	Passenger-train car-miles (000):				
4-08	Total in all locomotive-propelled trains	263,289	279,508	1,028,779	1,122,736
4-09	Total in coal-burning steam locomotive trains	62,445	84,459	224,759	365,521
4-10	Total in oil-burning steam locomotive trains	33,350	43,547	136,146	175,518
4-11	Total in Diesel-electric locomotive trains	149,854	132,834	596,076	506,490
12	Total car-miles per train-miles	9.26	9.09	9.38	9.05

YARD SERVICE (DATA FROM I.C.C. M-215)

1	Freight yard switching locomotive-hours (000):				
1-01	Steam, coal-burning	1,445	1,918	5,530	8,140
1-02	Steam, oil-burning	207	280	874	1,198
1-03	Diesel-electric[1]	2,393	1,921	9,205	7,488
1-06	Total	4,070	1,144	15,713	16,934
2	Passenger yard switching hours (000):				
2-01	Steam, coal-burning	61	94	251	417
2-02	Steam, oil-burning	12	16	51	69
2-03	Diesel-electric[1]	222	201	882	792
2-06	Total	329	346	1,320	1,418
3	Hours per yard locomotive-day:				
3-01	Steam	7.80	8.60	7.50	9.00
3-02	Diesel-electric	17.50	17.70	17.30	17.70
3-05	Serviceable	14.00	13.40	13.70	13.50
3-06	All locomotives (serviceable, unserviceable and stored)	11.70	11.40	11.30	11.60
4	Yard and train-switching locomotive-miles per 100 loaded freight car-miles	1.79	1.87	1.87	1.96
5	Yard and train-switching locomotive-miles per 100 passenger train car-miles (with locomotives)	0.77	0.77	0.80	0.78

[1] Excludes B and trailing A units.

from 6.5 per cent to an even 5 per cent of the present car fleet.

The ultimate goal is the net addition of approximately 69,000 box cars, 36,000 gondolas, 11,000 hoppers and 8,000 flat cars to bring the present fleet up to a new "level" of 1,850,000 cars.

Association President William T. Faricy said he hoped the 10,000 cars-a-month goal would be a reality by January, 1951, but he emphasized it would take far more than a year's production at that rate actually to bring the car fleet—presently numbering 1,727,873 units—to the final objective of 1,850,000 cars. Retirement of the obsolete and "war weary" he said, has been running close to 72,000 cars per year since 1948. But with the proposed rehabilitation program, many older cars in the present fleet will get a new lease on life, and Mr. Faricy indicated the retirement figure would drop to around 50,000 cars per year for the next two years, at least.

The national goal of 1,850,000 cars is divided by types as follows: Box cars, 775,000; gondolas, 325,000; hopper cars, 575,000; and flat cars, 55,000.

To the press, Mr. Faricy made it clear that the Chicago meeting was not a hasty move prompted by the Korean military crisis. On the contrary, growing civilian car needs, stemming in large measure from industry's five-day work week and free weekend demurrage, had made special action necessary a considerable time before the war started.

A shortage of steel looms as the biggest deterrent to achievement of the car program, although Mr. Faricy said he expected complete cooperation from both the car builders and the steel industry. If steel allocation becomes necessary, he said he hoped it would be on a vountary basis.

In calculating the nation's new freight car needs, Mr. Faricy said that the railroads had had the very finest kind of cooperation from the National Industrial Traffic League and from the 13 regional shipper's advisory boards. To these groups, and to shippers in general, the railroads have pledged "to do all in their power to obtain the most efficient use of freight cars. As a part of their program to increase transportation output, the members have set as a goal a national average of 50 miles per freight car per day, or approximately the figure attained during World War II." [The 1949 figure—which includes not only cars en route, but also those being loaded, unloaded and awaiting repairs—was 39.3 miles per day.]

Aluminum Sheet and Place Nomenclature Approved

To clarify the designation of aluminum sheet and plate, the Sheet Division of the Aluminum Association has adopted standard nomenclature for these products as follows:

Plate—a solid section rolled to a thickness of 0.250 in. and heavier, in rectangular form with either sheared or sawed edges.

Sheet—a solid section rolled to a thickness range of 0.006 in. to 0.249 in. inclusive, supplied with sheared, slit, or sawed edges. *Flat sheet* is furnished in rectangular form with sheared, slit, or

NO PIN ROTATION

The square-headed retaining pin is held securely in place by a flanged hood ear bent over the pin head as an anvil.

NO EYE ELONGATION

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sawed edges, which may be flattened by any standard method. *Coiled sheet* is furnished in rolls (coils) with slit edges.

Heretofore, the terms "strip" and "coiled sheet" were applied interchangeably to the same product, but the new nomenclature officially recognizes the latter, more descriptive term.

The definitions were formulated by a Sheet Division committee comprised of representatives of the Aluminum Company of America; Sheet Aluminum Corporation; Kaiser Aluminum & Chemical Corp.; Reynolds Metals Co.; Revere Copper & Brass, Inc., and Fairmont Aluminum Company.

SUPPLY TRADE NOTES

TURCO PRODUCTS, INC.—Turco Products, Inc., has acquired a plant at 120 Lister avenue, Newark, N. J., for use as a manufacturing and laboratory center for Turco's Atlantic Division. *N. B. Williford* has been appointed production superintendent of the division. *Thomas Franzreb*, process engineer, formerly of Philadelphia, Pa., is forming and will head a process engineering group to make special field studies of cleaning problems in the plants of eastern customers. Headquarters will be at Newark.

◆

GENERAL STEEL CASTINGS CORPORATION. —*Albert M. Schieler* has been appointed district manager—sales of the General Steel Castings Corporation at Granite City, Ill.

Mr. Schieler joined the Commonwealth Steel Company and General Steel Castings

Albert M. Schieler

in 1920 as an office boy, after two years of high school. Subsequently he completed high school at night and also took courses with the International Correspondence Schools and LaSalle Extension University. Until 1929 he held various stenographic

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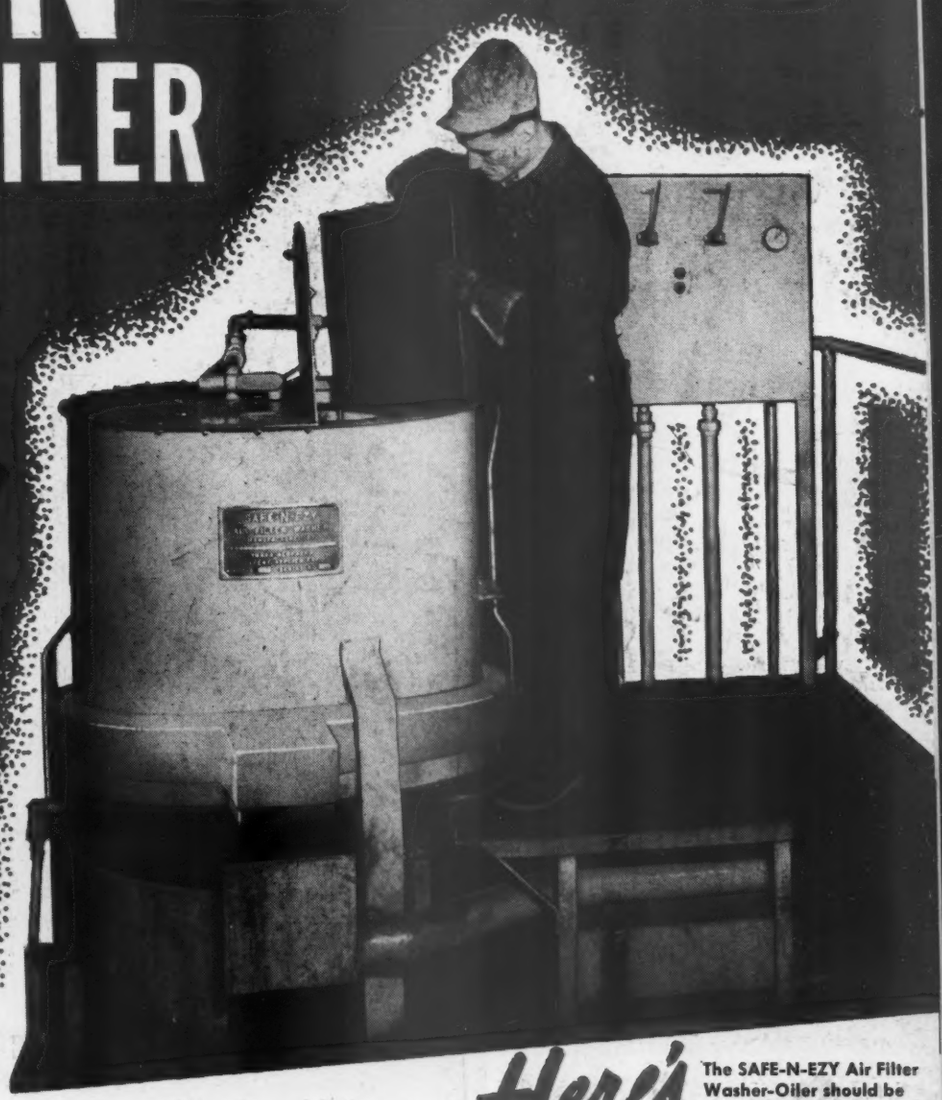


ONE MACHINE
ONE MAN
ONE HANDLING

...aster... More Efficient... Less ...xpensive Air Filter Maintenance

...last—reasonably priced cleaning and oiling equipment that cuts air filter ...ntenance and service costs to the bone!

SAFE-N-EZY Air Filter Washer-Oiler thoroughly cleans and oils standard permanent type locomotive and passenger car air filters at a speed never ...re possible by other methods.

...machine, a complete, packaged unit does the entire job of thorough clean- and oiling, employing centrifugal action. Design provides for *tailored* ...ning to suit the condition of each load of filters. Under this modern wash- ...and oiling tech...nique the filters are cleaned and *dried* before the oil is sprayed Centrifugal action assures thorough, even oiling.

...unusual compactness of the Washer-Oiler—less than 30 sq. ft. of floor ...e—permits convenient installation in existing service plants. Power is pro- ...d by a single, totally enclosed fan-cooled electric motor with direct, wholly ...osed "life-time" drives. No chains or belts are used.

Here's Why

The SAFE-N-EZY Air Filter Washer-Oiler should be standard equipment at each of your service points:

1. **FAST...THOROUGH...ECONOMICAL**
2. **CLEANS AND OILS FILTERS IN ONE HANDLING**
3. **COMPACT...A SINGLE PACKAGED UNIT**
4. **REDUCES FILTER INVENTORY**
5. **SIMPLE, ONE-MAN OPERATION**
6. **SAVINGS QUICKLY AMORTIZE INVESTMENT**

P. MAXTON-MITCHELL CO. ENGINEERS FOUNDERS CRAFTSMEN

Department RM9 Omaha 5, Nebraska

Railway Supplies—Specialty Appliances, Tools and Parts for Locomotives and Cars

...Sales ...gents ...AFE-N-EZY ...r Washers:

MOUNTAIN REGION SUPPLY CO.
813 City National Bank Building
Omaha, Nebraska—Harney 0246

W. D. JENKINS
1317-18 Praetorian Building
Dallas, Texas—C-4880

PAUL D. CURTIS CO.
First National Bank Building
Saint Paul, Minnesota—Cedar 8556

O.K. COMPANY
513 Railway Exchange Building
Chicago, Illinois—Harrison 5955

ECONOMY ARCH CO.
1701 Ambassador Building
Saint Louis, Missouri—Chestnut 5694

C. A. OTTO
Box 123
Saint Davids, Penn.—Wayne 0207

TOM HODGES
216 Norman Road
Greenacres—Portsmouth, ...

JOHN D. McGILLIS
3006 Brighton Avenue
Montreal 26, Quebec

FRANK M. SWEENEY
4136 Roland
Baltimore, Md.—Tuxedo 56

and other office jobs. He was then appointed material expediter, and from 1934 to 1940 served, first as manufacturing engineer, and, later, as assistant to the works manager at the Commonwealth plant. In 1940 he became superintendent of the finishing and P.M.S. departments at the same plant, and in June, 1945, was made assistant manager of the service department. Mr. Schieler joined the sales department in 1947 as sales representative for the southern district.

◆

GENERAL ELECTRIC COMPANY. — *Jack Hause* has been appointed manager of the transportation division of the apparatus department of the General Electric Company, at St. Louis, Mo., headquarters of the department's newly formed mid-states district.

Mr. Hause joined G.E. in 1937 and was assigned to general sales engineering work

Jack Hause

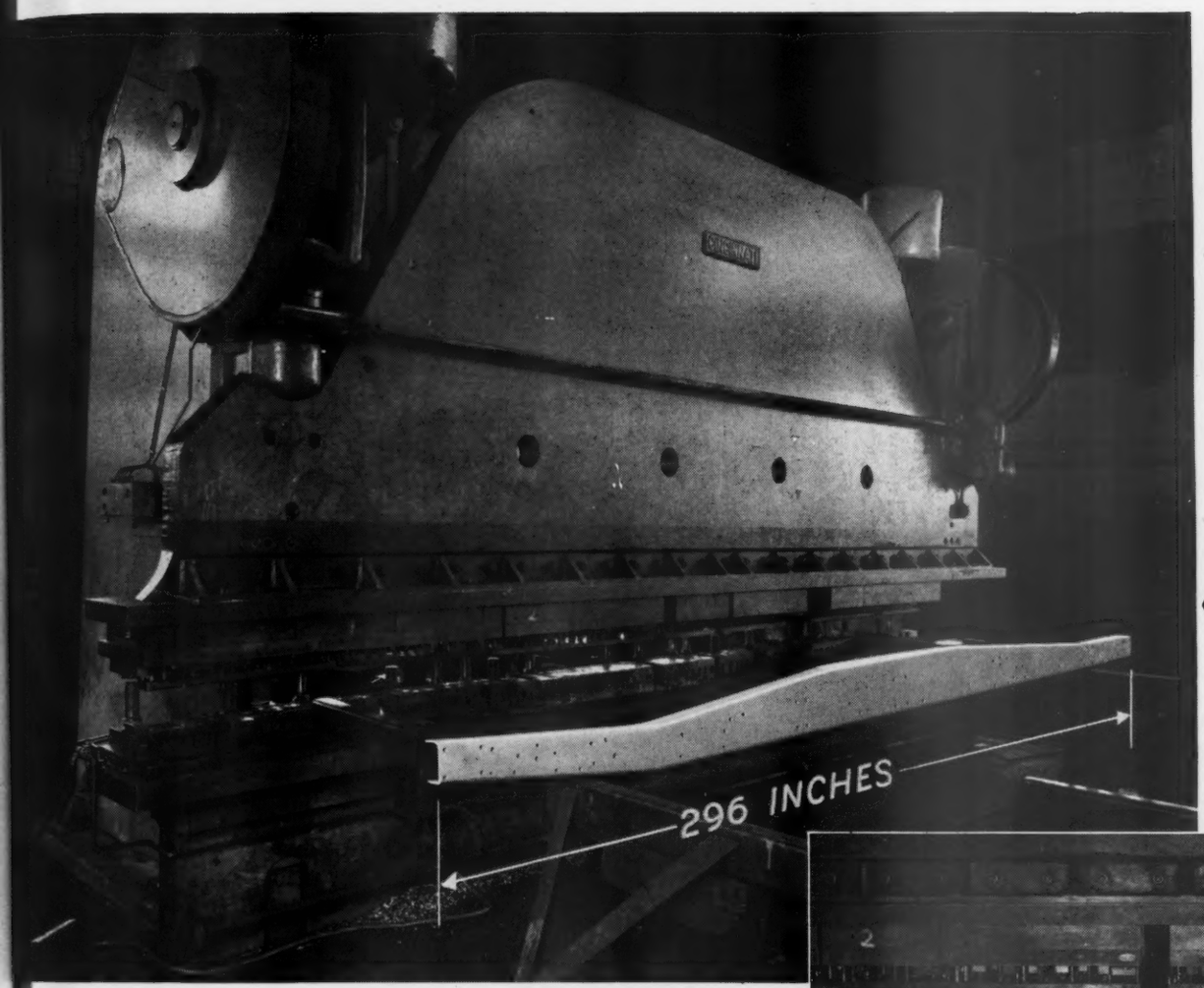
at Washington, D. C., for two years. In 1940 he was transferred to the locomotive and car equipment divisions at Erie, Pa., where he specialized in mine and industrial locomotives and railroad-type electric and Diesel-electric locomotives. He was an application engineer on the new Alco-G.E. gas-turbine electric locomotive prior to becoming manager of the transportation division.

◆

BALDWIN-LIMA-HAMILTON CORPORATION. —*Marvin W. Smith*, president of the Baldwin Locomotive Works, and *George A. Rentschler*, chairman of the executive committee of Lima-Hamilton Corporation, have jointly announced that the boards of directors of their respective companies have approved the substance of a plan to consolidate operations of the two companies under the name of Baldwin-Lima-Hamilton Corporation.

The plan is subject to working out all necessary details and to required action by stockholders of both companies. It is proposed that Mr. Rentschler will be chairman of the board, and Mr. Smith president, of the new corporation, assets of which will be valued at approximately $120,000,000.

"The principal products of the two companies," the Smith-Rentschler announcement said, "supplement each other and will result in better diversification. In



Material: $\frac{1}{4}$" mild steel. Maximum number of holes: 104. Maximum diameter of hole: $1\frac{1}{16}$".

A close-up of the punch and die setup which gives 116 combinations.

PHOTO—COURTESY YOUNGSTOWN STEEL CAR CORP.

PUNCHING

104 HOLES EVERY 10 SECONDS

The multiple punching of these holes must be very rapid; however, another important requirement is the maintenance of accurate location, and the spacing of one hole from another.

The assembly which follows is smooth and certain—no costly misfits on these 24-foot trailer frames.

On this Cincinnati Press Brake the spacing, the number of holes or the size of the holes may be changed quickly and economically, as required . . . or the brake may be used for many other operations—all accomplished with minimum time loss and at low cost.

Write for Catalog B-2. It illustrates many applications for the press brake and press work performed on Cincinnati Press Brakes.

THE CINCINNATI SHAPER CO.

CINCINNATI 25, OHIO U.S.A.

SHAPERS · SHEARS · BRAKES

the Diesel-electric locomotive field there should be substantial advantages in integrating the activities of the two organizations."

◆

BALDWIN LOCOMOTIVE WORKS.—*E. R. Wisner*, who has been associated with Baldwin since 1947, has been appointed manager, locomotive department, in which capacity he will direct sales activities in connection with complete locomotives of all types, and *E. F. Sheehan*, assistant manager of the renewal parts department, has been appointed manager of the department, with complete charge of all activities connected with renewal parts for both Diesel and steam locomotives.

Mr. Sheehan received his early training in the railroad field with the Lima Locomotive Works (now part of the Lima-Hamilton Corporation) and the Norfolk & Western. He joined Baldwin in March, 1939, and served successively as assistant to works manager, assistant to vice-president—operations, coordinator of purchases and stores, and assistant manager, renewal parts department.

E. F. Sheehan

◆

PULLMAN-STANDARD CAR MANUFACTURING COMPANY.—*Charles W. Bryan, Jr.*, of New York has been elected president of the Pullman-Standard Car Manufacturing Company. Mr. Bryan was formerly associated with the Federal Shipbuilding & Dry Dock Co. *Champ Carry*, who has been president of Pullman-Standard, will continue to be associated directly with the car manufacturing company as chairman of its board of directors. He also will continue as president and chief executive officer of Pullman, Inc.

Roy F. Johnson, who has been appointed manager of the sales and service engineering division of the Pullman-Standard Car Manufacturing Company at Chicago, as announced in the July issue, was born on December 22, 1892, at Litchfield, Ill. His business career began in September, 1909, when he joined the Pullman Company at Chicago as a junior draftsman. Two years later he transferred to the Atchison, Topeka & Santa Fe at Chicago, serving as draftsman-inspector until 1912. Subsequently he held various positions successively with the Haskell & Barker Manufacturing Co., the Federal Cement Tile Company, the Ryan Car Company, and

WALWORTH LUBRICATED PLUG VALVES

offer these advantages

- . . . Direct port opening
- . . . Quarter turn opens or closes valve
- . . . Dead tight shut-off
- . . . Freedom from attack by fluids being handled
- . . . Pressure sealed
- . . . Made in a complete line. Sizes from ½" to 24" for pressures from 175 to 5,000 psi., and for vacuum requirements

THESE are just a few of the reasons why Walworth Lubricated Plug Valves give "top" performance on many *difficult* services.

All Walworth Lubricated Plug Valves employ special insoluble lubricants which protect the plug and body against contact with the line fluid, thus combatting erosion and corrosion.

The lapped surfaces of the valve are "pressure sealed" when the valve is in either the open or closed position. By turning the lubricant screw, lubricant is forced under high pressure through a grooving system that completely encircles the ports as well as the top and bottom of the plug.

The lubricant seals the valve against leakage, and reduces friction between plug and body. This permits easy, quick, full-opening, or tight shut-off with only a quarter turn of the plug.

Number 1700 (illustrated) is a Steel-iron valve, wrench operated, designed for a working pressure of 200 pounds WOG (water, oil, or gas). Valves are available in either screwed or flange types. Screwed type have API line pipe thread lengths. Flanged type (No. 1700F) is faced and drilled to American Standard for 125-pound cast iron flanges unless otherwise specified.

For further information about No. 1700 as well as the complete line of Walworth Lubricated Plug Valves, write for catalog.

WALWORTH

valves and fittings

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD

the Streator Car Company. In 1927 Mr. Johnson worked dismantling coal mines at LaSalle, Ill. He returned to Ryan Car in 1929 as manager of works and later became general manager. From 1933 to 1934

Roy F. Johnson

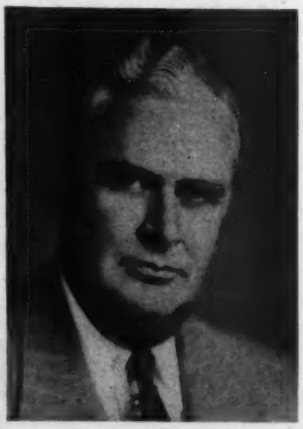
he was with the Edward G. Budd Company at Philadelphia, Pa., as a project engineer. He became liaison engineer of Pullman-Standard in 1934; engineer of research in 1939, and associated director—research in 1948.

◆

AMERICAN BRAKE SHOE COMPANY.—*Thomas J. Wood*, eastern district works manager in the operating department of the Brake Shoe and Castings Division of the American Brake Shoe Company, has been appointed chief metallurgist of the division. *Raymond A. Frick*, formerly plant superintendent, has been appointed eastern district works manager of the Division; *Ralph C. White* has been appointed superintendent of the north Kansas City, Mo., plant, and *Raymond A. Martinson* has been appointed superintendent of the Chicago plant of the division.

◆

SUPERHEATER COMPANY.—*Bard Browne*, vice-president of the Superheater Company, Division of Combustion Engineering-Superheater, Inc., has been appointed to direct also the activities of the western district sales department and the consolidated eastern and western service departments.



Philip D. Blanchard

Philip D. Blanchard has been appointed manager of service with headquarters at East

Clear the Track for Profit—

WITH REPUBLIC ALLOY STEEL PARTS!

Sidetrack those high maintenance costs that have been red-lighting profit—and go through on the green with long-service Diesel parts made of tough, wear-resistant Republic Alloy Steels!

Republic Alloy Steels react uniformly to heat treatment—produce hard working surfaces—resist fatigue, impact and extreme temperatures. Gears, studs, bolts, wrist-pins, connecting rods, crankshafts, valve springs, bearings and other mechanical parts live a lot longer life—help keep equipment rolling with less "downtime". Alloy steel parts are *good insurance* against danger of costly breakdowns in high speed freight and passenger service.

Republic offers you a 3-Dimensional Metallurgical Service. Veteran field metallurgists—working closely with laboratory and mill metallurgical staffs—are ready to give you prompt, helpful assistance in properly applying these cost-cutting steels to your specific requirements. Write, phone or wire us, today.

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Republic REPUBLIC STEEL ALLOY STEELS

Other Republic Products Include Stainless, High Strength and Carbon Steels—Sheets—Plates—Pipe—Bolts, Nuts and Rivets—Boiler Tubes

Chicago, Ind.; *H. Gene Harrison*, assistant manager of service at East Chicago, and

H. Gene Harrison

Samuel L. Brownlee, manager of sales, western district, with headquarters in the

Samuel L. Brownlee

Bankers' building, Chicago. *Roy J. Van Meter*, vice-president in charge of western sales and service, has retired.

◆

LEBANON STEEL FOUNDRY.—The Lebanon Steel Foundry has effected licensing agreements with the *Timken Roller Bearing Company* to produce and sell a heat-resistant super-alloy known by the trademark "16-25-6." Both patent and trademark registrations are owned by Timken.

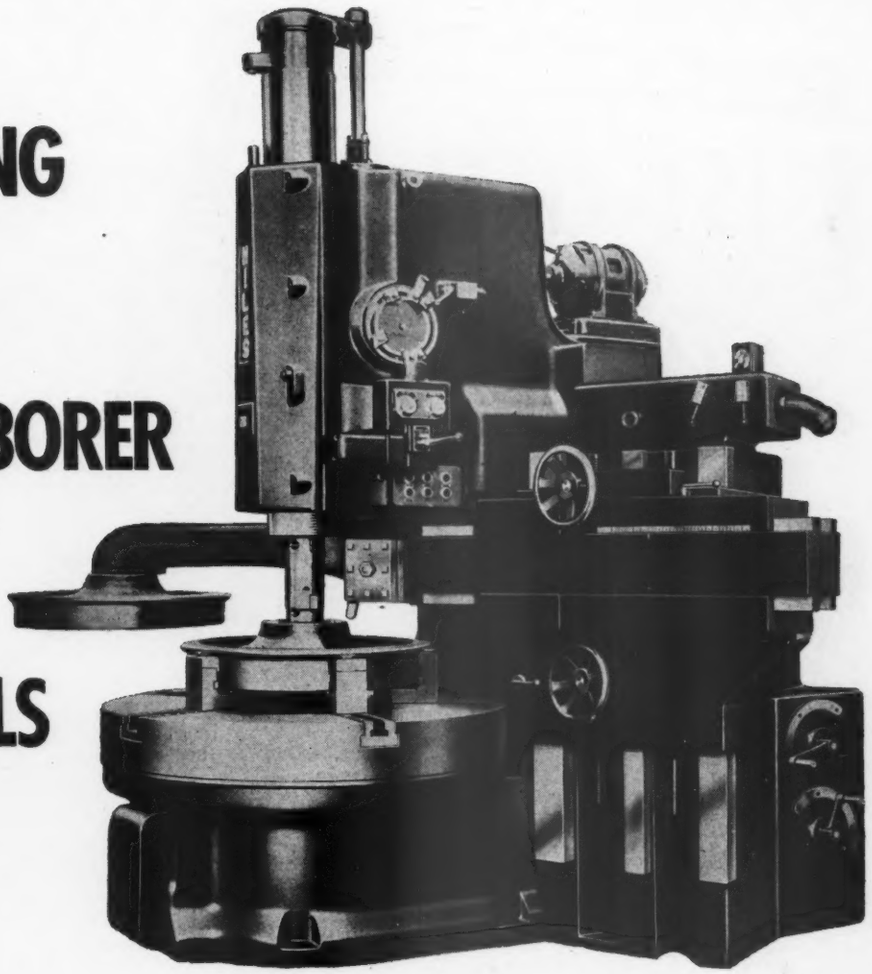
◆

UNITED STATES STEEL CORPORATION.—*A. Paul Selby* has been appointed assistant to the sales vice-president, United States Steel Corporation. Mr. Selby has been assistant general manager of sales of the Carnegie-Illinois Steel Corporation, a U. S. Steel subsidiary, since October, 1945.

◆

EUTECTIC WELDING ALLOYS CORPORATION.—The Eutectic Welding Alloys Corporation is sponsoring a $1,000 prize competition for technical papers having to do with research and development in the field of non-fusion welding processes. The competition opens September 1, 1950, and closes May 31, 1951. The subject of papers to be presented is defined as follows: technological and research aspects, advances

ANNOUNCING A NILES HYDRAULIC BORER FOR DIESEL WHEELS



To meet one of today's important maintenance problems—diesel wheels and the 40-hour week—Lima-Hamilton has developed a new hydraulic wheel borer, especially designed to speed the handling of diesel locomotive wheels.

This new machine resembles, in most respects, the highly successful Niles automatic car-wheel borer. However, it incorporates a side head equipped with hydraulic feed and a four-position turret. This permits the use of roughing, finishing, and radius tools in facing hubs—also makes possible machining of hub shoulders and outer dimensions and, when desired for balancing, machining of the web and rim.

The first two Niles borers for diesel wheels will be delivered in the near future to the Readville, Massachusetts. shops of the New Haven Railroad.

This Niles Hydraulic Borer has a range of table speeds and feeds designed for carbide tools. After the desired speeds and feeds for roughing, finishing and chamfering the bore are selected, they are automatically engaged at the proper time during the cycle. The boring cycle itself is entirely automatic, from movement of starting lever to return traverse of the boring bar and application of table brake. The side head is operated manually but with hydraulic feed in both horizontal and vertical directions. Wheels are chucked and unchucked simply by pressing buttons.

Bore sizes: up to 12 inch diameters. Wheel sizes up to 44 inches with flange down, or up to 48 inches with flange up.

For full information, call the Lima-Hamilton sales office in New York, Chicago or other principal cities, or write directly to Lima-Hamilton Corporation, Hamilton, Ohio.

LIMA HAMILTON CORPORATION

NILES TOOL WORKS CO. **HAMILTON, OHIO**

A division of the Lima-Hamilton Corporation

and advantages of the use of lower melting (lower than parent) filler metals in the non-fusion welding processes. Application of such processes may be by torch, furnace, induction, carbon arc, or metallic arc. Papers may specifically cover one or more of the following: oxyacetylene, low melting filler; oxyfuel gas, low melting filler; brazing and bronze welding; hard facing and resurfacing with low melting filler.

Three prizes will be awarded: first prize, $500; second prize, $300, and third prize, $200. The competition is open to welding engineers, researchers, metallurgists, instructors, university students, and all others qualified to present basic principles of the art and science of non-fusion welding. Rules governing the competition may be secured by writing to the Eutectic Welding Alloys Corporation, 40 Worth street, New York 13.

◆

BAKER-RAULANG COMPANY.—*Henry S. Haight* of the Haight Engineering Company, Charlottesville, Va., has been appointed district sales representative in Central Virginia for the Baker Industrial Truck division of the Baker-Raulang Company, Cleveland, Ohio. In this capacity, Mr. Haight will serve as material-handling consultant for Baker truck applications and handle sale of this equipment in his territory. Associated with Mr. Haight are *C. Mahanes*, service engineer, who will handle Baker truck maintenance in the same territory, and *A. C. Traynham*, who will act in a sales and consulting capacity in the Richmond, Va., area. The *Dillon Scale & Equipment Co.*, 3907 Elm street, Dallas 1, Tex., has been appointed as district representatives of the division for all but the southeast portion of Texas. All sales, service and engineering involving Baker industrial truck applications will be handled by a staff of materials handling consultants working under *John W. Gilliam, Jr.*, vice-president in charge of sales.

◆

CARBOLOY COMPANY. — *Kenneth R. Beardslee*, vice-president and marketing manager of the Carboloy Company, has been named president, to succeed the late Walter G. Robbins.

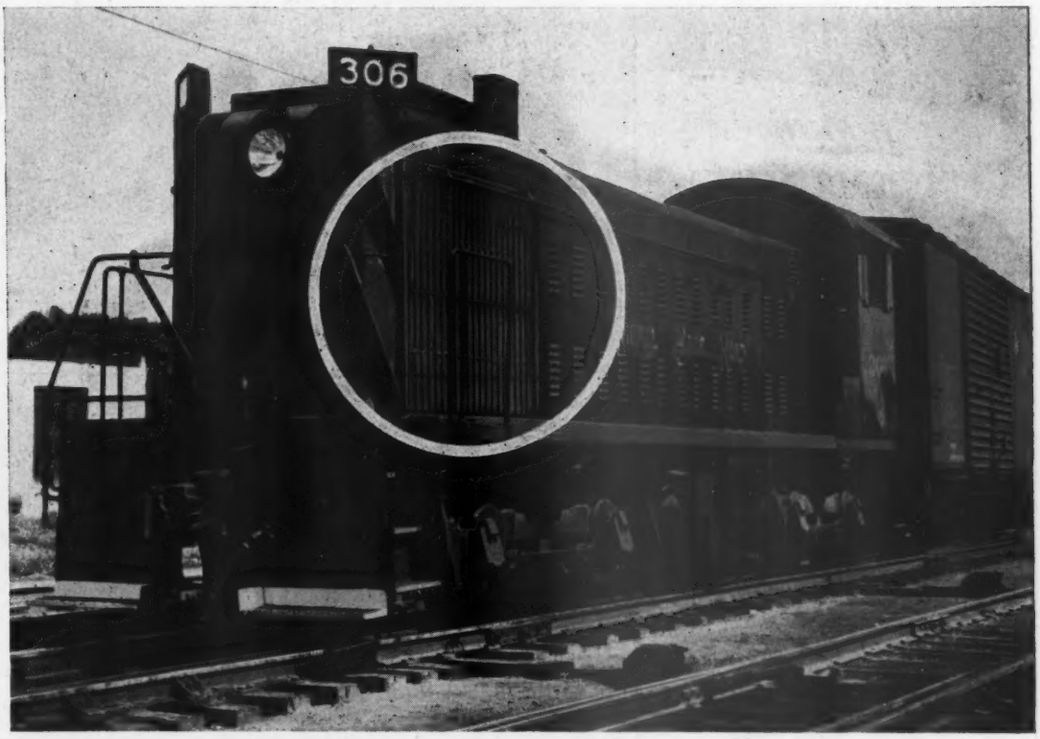
◆

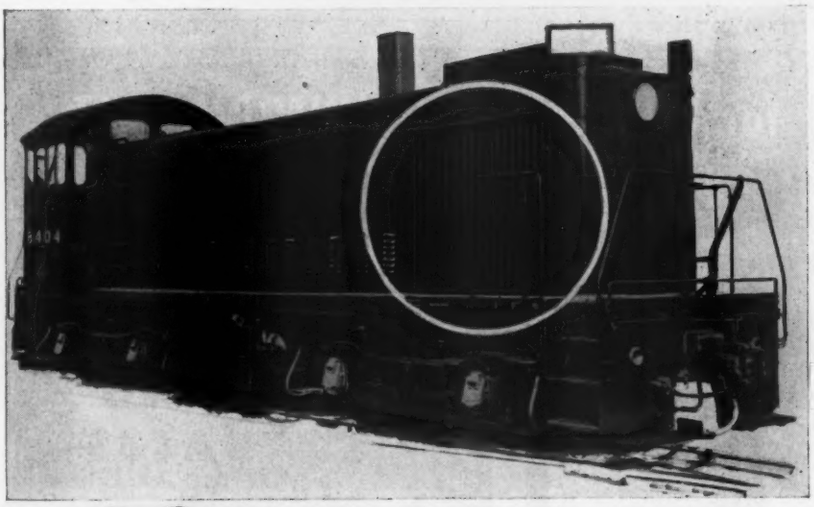
NATIONAL TUBE COMPANY.—*William F. McConnor*, formerly vice-president in charge of sales of the National Tube Company, a subsidiary of the United States Steel Corporation, has been elected executive vice-president, and *H. J. Walla* has been elected vice-president in charge of sales, succeeding Mr. McConnor. *William J. McKee*, formerly sales manager, Central area, has been appointed general manager of sales, and *Louis W. Mason*, formerly assistant to general manager of sales, succeeds Mr. McKee.

◆

GENERAL MOTORS DIESEL LIMITED.—General Motors Diesel Limited officially opened its new Canadian Diesel locomotive building plant at London, Ont., on August 11. The event was celebrated with a luncheon, at which E. V. Rippingille, Jr., president of General Motors Diesel Limited, was host to several hundred guests,

Good Things Go Together!





KYSOR SHUTTERS

are used on LIMA-HAMILTON LOCOMOTIVES

•

25TH ANNIVERSARY
KYSOR HEATER CO.
CADILLAC, MICHIGAN
"BUILT TO LAST"

Uniform heat, properly controlled, is helpful to an Engine
KYSOR SHUTTERS *provide TEMPERATURE CONTROL!*

"Built to Last"

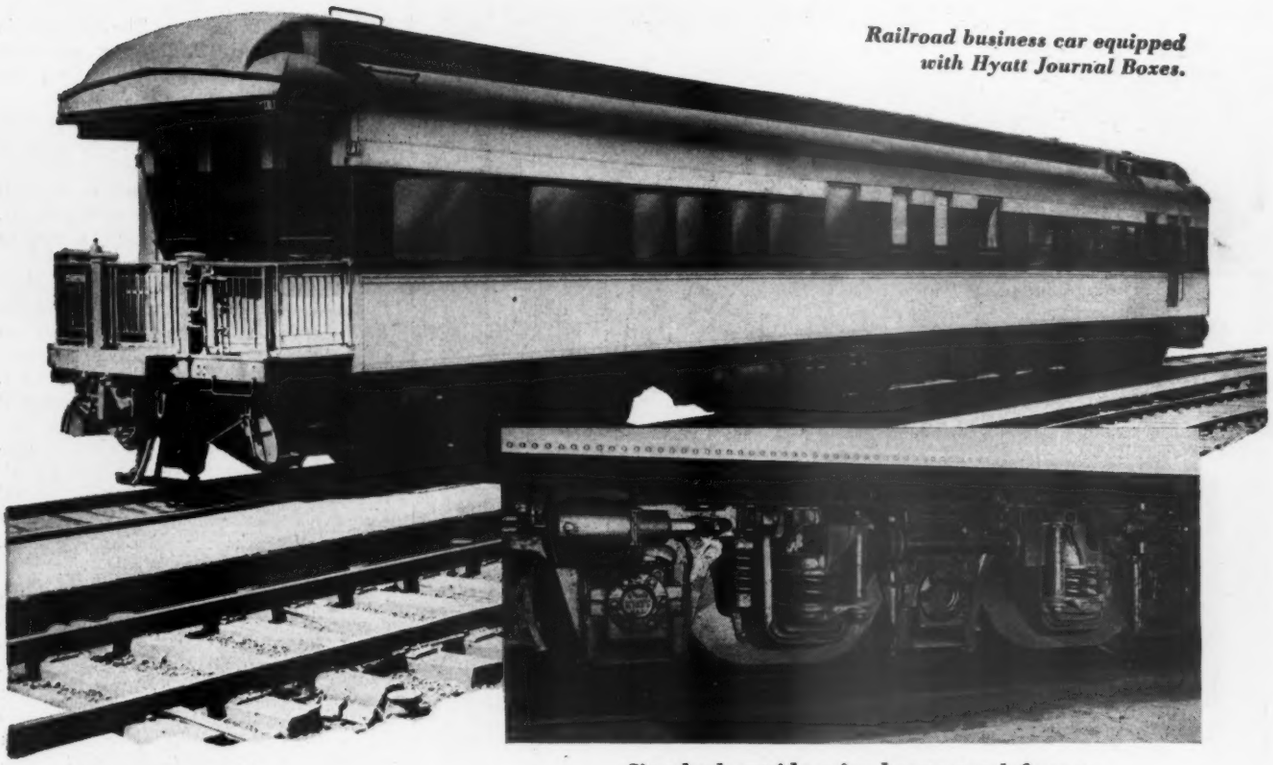
KYSOR HEATER COMPANY Cadillac, Michigan

CANADIAN REPRESENTATIVES... RAILWAY & POWER ENGINEERING CORP.

NEW GLASGOW · MONTREAL · NORANDA · NORTH BAY · TORONTO · HAMILTON · WINDSOR · WINNIPEG · EDMONTON · VANCOUVER

An FP7A locomotive unit being lowered on its trucks at the London, Ont., plant of General Motors Diesel, Ltd.

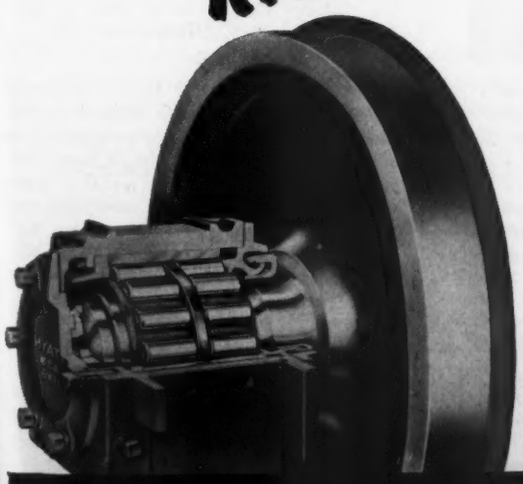
including representatives of industry, of commerce, of the business press and newspapers from Canada and the United States, and of the municipal, provincial and dominion governments. In the afternoon, following a tour of the plant, dedication ceremonies were held, at which the guests and plant employees were present. The luncheon addresses were delivered by the Honorable Ray Lawson, lieutenant governor of Ontario, and Charles F. Kettering, research consultant and director of Gen-



Railroad business car equipped with Hyatt Journal Boxes.

Six wheel, outside swing hanger truck from a Hyatt-equipped business car.

FREE LATERAL—
CONTROLLED LATERAL—
BETTER RIDING



Railroad executives must go over the lines to meet their operating men, also, they find it advantageous to visit with their shippers who provide the bulk of their traffic or freight movements.

• • •

On the line or off the line the demands upon their energy is taxing—they must keep fit and be fit.

• • •

Possibly that is one of the many reasons why the mechanical departments have equipped the traveling offices of so many busy executives with Hyatt Roller Bearing Journal Boxes in the past few years.

• • •

We can furnish boxes for any type truck—new or old and just now we are furnishing boxes for a number of additional business cars. May we help you to smooth out the travel of your executives?

• • •

Call or write Hyatt Bearings Division, General Motors Corporation, Harrison, New Jersey.

HYATT ROLLER BEARING JOURNAL BOXES

eral Motors Corporation. The speakers in the afternoon were C. E. Wilson, president of the General Motors Corporation, and Mr. Lawson.

The new locomotive plant is built on a site of 210 acres. It covers an area of 198,276 sq. ft. and, with an employment at full operation of 1,000 men, is expected to produce one lomocotive unit per day. These units will be of six types, ranging from 600 to 1,500 hp.

The plant was built in an usually short time. Ground was broken September 22, 1949; erection of the steel began on December 1; the plant office was occupied on May 8, 1950, and the plant on June 1. At the present time 700 employees are at work.

Diesel engines and the electric generators and motors are not being built at the Canadian plant. Electric control equipment, chasses, cabs, fuel and water tanks, and trucks are all Canadian built.

◆

LODGE & SHIPLEY CO.—The following companies have been appointed distributors for the Lodge & Shipley Co., Cincinnati, Ohio: The *Gilles Machinery Company*, 812 Huron road, Cleveland, Ohio; the *John E. Livingstone Company*, 16516 James Couzens highway, Detroit, Mich.; the *Edmond E. Burke Company*, 17 Seventeenth street, Toledo, Ohio; *Strauss & Hass, Inc.*, 524 Camp street, New Orleans, La.; and the *Peerless Supply Company*, 701 Spring street, Shreveport, La. Sales and service in the Cincinnati area will be handled directly by the factory office at 3055 Colerain avenue.

◆

HASKELITE MANUFACTURING CORPORATION.—*Edward A. Sipp* has been appointed exclusive railway agent in the Chicago area for the Haskelite Manufacturing Corporation, Grand Rapids, Mich.,

Mr. Sipp formerly was associated with the Pyle-National Company, the Gustin-Bacon Manufacturing Company and the Reynolds Metals Company, successively. He recently established his own railway sales organization to handle Haskelite railway products, and will be located in the Chicago district sales office of Haskelite, Room 1156, Merchandise Mart.

◆

ALEXANDER MILBURN, INC.—Alexander Milburn, Inc., 1231-1245 Ridgely street, Baltimore 30, Md., has been organized to manufacture and market the Milburn line of oxy-acetylene cutting and welding apparatus, regulators for oxygen, acetylene and other gases, accessories and supplies, and portable carbide lamps. Since 1945, Milburn equipment has been marketed by the Black Manufacturing Company, Parkton, Md.

◆

NATIONAL LOCK WASHER COMPANY.—*Gilbert E. Webster*, formerly vice-president and director, has been elected president of the National Lock Washer Company, Newark, N. J.

◆

KENNAMETAL, INC.—*Floyed Monteith, Robert Karakoosh, William Collins* and *Harold D. Killmer*, formerly service engineers of *Kennametal, Inc.*, Latrobe, Pa.,

TOP TO BOTTOM...FRONT TO BACK...
NO-OX-IDs PROTECT LOCOMOTIVES AGAINST CORROSION

NO-OX-ID Filler Red "C" applied to the outside of the boiler shell before the lagging is put in place protects against corrosion for periods between shoppings. NO-OX-ID EXP. 2W affords positive protection against corrosion to the underside of the locomotive jackets. With NO-OX-ID Front End Coating No. 2, front ends and smoke boxes retain their like-new appearance and are protected against corrosion. This NO-OX-ID coating will not build up and add to the insulation and it may be easily removed without sand blasting.

These are typical NO-OX-IDs used in the railroad industry to protect valuable equipment against corrosion. There is a correct NO-OX-ID and a method of application to meet every rust preventive requirement. Consult with your Dearborn Engineer for assistance in the selection of the NO-OX-IDs best suited to your needs.

DEARBORN CHEMICAL COMPANY
310 S. Michigan Ave., Chicago 4, Illinois

GET INFORMATIVE NO-OX-ID BULLETINS

A series of bulletins on rust prevention in the railroad industry is available to you. These bulletins will show you how you can benefit by the correct NO-OX-IDs and will aid you in their selection. Mail the coupon.

Dearborn
Reg. U. S. Pat. Off.
THE ORIGINAL RUST PREVENTIVE
NO -- OX -- ID
IRON + OX = RUST

DEARBORN CHEMICAL COMPANY
310 S. Michigan Ave., Dept. RM
Chicago 4, Illinois

Gentlemen:
Please send me bulletins on NO-OX-ID for the railroad industry.

Name.....

Company.....

Address.....

City.....*State*.....

have been appointed sales representatives. Mr. Monteith will work out of the Chicago office and Messrs. Karakoosh, Collins and Killmer will maintain headquarters at Springfield, Mass. *Conrad Seim* has been appointed service engineer at Los Angeles, Calif.

◆

THOMAS A. EDISON, INC.—*W. E. Olson* and *J. W. Werrell*, sales engineers for *Thomas A. Edison, Inc.*, have been appointed district managers of the primary battery division, with headquarters as before at Bloomfield, N. J.

◆

WORTHINGTON PUMP & MACHINERY CORP.—*W. H. Feldman* has been appointed vice-president in charge of sales for the Worthington Corporation. Mr. Feldman was formerly president of the Electric Machinery Manufacturing Company, Minneapolis, Minn., a subsidiary of Worthington.

◆

RIGIDIZED METALS CORPORATION.—*Robert G. Leary* has been appointed general sales manager of the *Rigidized Metals Corporation, Buffalo, N. Y.* For the last 14 years Mr. Leary has been associated with the Eastern Stainless Steel Corporation, Baltimore, Md., and recently resigned his position as general sales manager.

◆

MICROMATIC HONE CORPORATION.—*George Eldred* has been appointed abrasive sales manager of the Micromatic Hone Corporation. Mr. Eldred, who has been with Micromatic for thirteen years, was formerly Manager of the eastern sales territory.

◆

NICKEL CADMIUM BATTERY CORPORATION.—*B. C. MacDonald & Co.*, Arcade building, St. Louis 1, Mo., and the *Frank B. Nugent Company*, 710 Pioneer building, St. Paul 1, Minn., have been appointed railway sales representatives for the Nickel Cadmium Battery Corporation.

Obituary

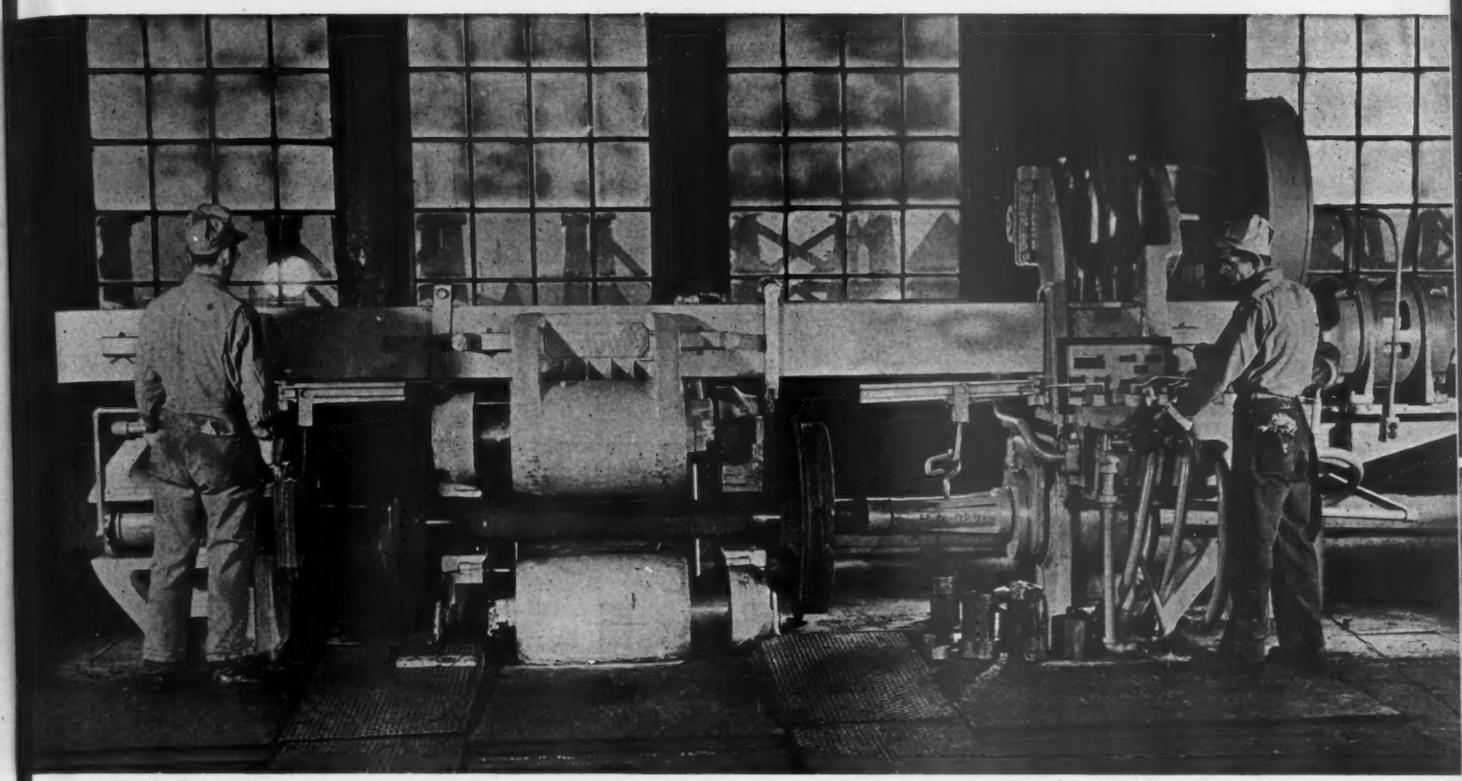
OTTO R. HILDEBRANT, in charge of midwest railroad sales for the K. W. Battery Company, with headquarters at Chicago, died on July 25 in Norfolk, Va., after a short illness, at the age of 68.

PERSONAL MENTION

General

J. T. PATTERSON, mechanical engineer of the Norfolk Southern at Carolina Junction shops, Norfolk, Va., has retired on account of physical disability, after 31 years of service with that road.

E. A. SWEELEY, general mechanical superintendent of the Fruit Growers Express, the Western Fruit Express and the Burlington Refrigerator Express at Alexandria, Va., has been appointed assistant to



CHAMBERSBURG DUPLEX WHEEL PRESS STRIPPING WHEELS AT B. & O. CENTRALIZED CAR WHEEL SHOP, GLENWOOD, PA.

Because the floor-to-floor wheel-stripping time of the Chambersburg Duplex Wheel Press—frequently clocked at 42 seconds—is unequalled by any other method, it more than meets the requirements of the centralized wheel shop.

CHAMBERSBURG ENGINEERING COMPANY, CHAMBERSBURG, PA.

STRIPPING TWO CAR WHEELS SIMULTANEOUSLY AT N.Y.O. & W.R.R. SHOPS, MIDDLETOWN, N. Y.

president of those companies at Washington, D. C. Mr. Sweeley has had almost a half century of railroad and refrigerator car-line service. Starting with the New York Central in 1902, he served in an official capacity with a number of other railroads, including the Atlantic Coast Line and the Seaboard Air Line, until appointed a member of the former Railroad Adjustment Board under the United States Railroad Administration, 1918 to 1920. Mr. Sweeley entered F.G.E. service in May, 1920, as mechanical superintendent, and became general mechanical superintendent of the three companies in May, 1947.

E. A. Sweeley

PAUL W. KIEFER, chief engineer equipment, New York Central System, has been awarded the George R. Henderson Medal by the Franklin Institute, Philadelphia, Pa. According to Dr. Henry B. Allen, executive vice-president of the Institute, the award is for "the noteworthy accomplishments achieved by Kiefer in the railroad equipment field." The medal will be presented to Mr. Kiefer on October 18 at the Institute.

P. W. Kiefer

J. M. PIERCE, whose retirement as superintendent of machinery of the Kansas City Southern Lines, at Pittsburg, Kan., was reported in the August issue, was born February 7, 1885, at Paris, Tenn. He entered railroad service in November, 1908, as a machinist with the K. C. S. at Shreveport, La. In 1914 he was appointed enginehouse foreman, in 1918, general foreman, and in

STANDARD ENGINEER'S REPORT

DATA

LUBRICANT	RPM Delo R.R. Oil
UNIT	Locomotive diesel engines
SERVICE	Freight and passenger
OPERATION	Local and transcontinental
MAINTENANCE	Progressive

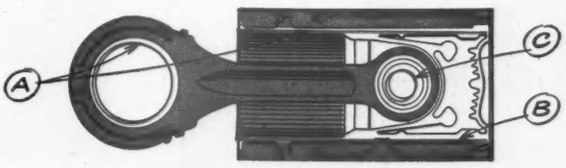
One million miles of service from engine parts!

LUBRICATED WITH RPM DELO R.R. OIL, many diesel engines in the locomotives of U.S. railroads have been in service for long periods without complete overhaul! Many of the liners, pistons, bushings and other parts in these engines have now been in use for hundreds of thousands of miles. Progressive maintenance inspections indicate that RPM DELO R.R. Oil will keep the parts in service for at least one million miles, the general overhaul period set by some of the railroads.

RPM DELO R.R. Oil keeps parts clean and free of wear-causing lacquer and gum deposits and is not corrosive to engine metals of any kind.

IN OVERLAND MOUNTAINOUS FREIGHT SERVICE for nearly 500,000 miles, this liner, lubricated with RPM DELO R.R. Oil has less than 0.006 inch wear and taper is so minor that it is barely measurable.

How RPM DELO R.R. Oil prevents wear, corrosion, oxidation



A. Special additive provides metal-adhesion qualities...keeps oil on parts whether hot or cold, running or idle.

B. Anti-oxidant resists deterioration of oil and formation of lacquer...prevents ring-sticking. Detergent keeps parts clean...helps prevent scuffing of cylinder walls.

C. Special compounds stop corrosion of any bushing or bearing metals and foaming in crankcase.

THIS PISTON AND CONNECTING ROD have been in service for more than four years. After picture was taken it was put back in the engine for further use. Note the excellent condition of the rings and bearing. All the rings are free, oil holes open and there are no troublesome deposits in any ring grooves.

FOR MORE INFORMATION about this or other petroleum products of any kind, or the name of your nearest distributor handling them, write or call any one of the companies listed below.

RPM DELO LUBRICATING OILS

TRADEMARK "RPM DELO" REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA • San Francisco
THE CALIFORNIA OIL COMPANY • Barber, N.J., Chicago, New Orleans
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA COMPANY • Denver, Colorado

1922 master mechanic at Heavener, Okla. From 1923 to 1929, Mr. Pierce served as master mechanic at Shreveport, and subsequently at Pittsburg until 1931, when he was appointed general master mechanic at Pittsburg. He returned to Shreveport in 1937 as master mechanic; became general master mechanic there in 1944, and later in 1944 superintendent of machinery.

WALTER A. MILLER, assistant to mechanical engineer of the Norfolk Southern, has been appointed mechanical engineer, with headquarters at Carolina Junction shops, Norfolk, Va. Mr. Miller was born on June 20, 1921. He is a graduate in

W. A. Miller

electrical engineering of the North Carolina State College, Raleigh, N. C. Upon graduation in 1944 he entered military service and was attached to the 3110 Signal Service Battalion as a first lieutenant. He was discharged from service on September 1, 1946, and on January 15, 1947 became assistant to mechanical engineer on the Norfolk Southern. The position of assistant to mechanical engineer has now been abolished.

J. T. PATTERSON, mechanical engineer of the Norfolk Southern at Norfolk, Va., has retired because of physical disability after 31 years of service with that company.

L. H. COOPER, shop superintendent of the Atlantic Coast Line at Rocky Mount, N. C., has been appointed acting superintendent motive power of the Western division at Fitzgerald, Ga.

H. M. NELSON, assistant general mechanical superintendent of the Fruit Growers Express, the Western Fruit Express and the Burlington Refrigerator Express, has been appointed general mechanical superintendent of those companies, with headquarters as before at Alexandria, Va.

H. J. STEIN, mechanical engineer of the Atlantic Coast Line, has been appointed chief mechanical engineer, with headquarters as before at Wilmington, N. C.

Car Department

E. LEONARD NYLANDER, whose appointment as superintendent car department of the Chicago, Rock Island & Pacific, with headquarters at Chicago, was reported in

the August issue, was born on January 29, 1899, in Chicago. He began his career with the Rock Island in June, 1913, and held various positions until 1932 when he be-

E. Leonard Nylander

came assistant car foreman at Peoria, Ill. Six years later he was transferred as assistant car foreman to El Reno, Okla., and in 1941 was promoted to car foreman at Little Rock, Ark. He returned to El Reno in 1944 as chief car inspector, second district, and became car foreman at Peoria in 1945.

JOHN F. LIKARISH, general car foreman of the Great Northern at St. Paul, Minn., has been appointed master car builder, with headquarters at St. Paul. Mr. Likarish started in the car department of the

John F. Likarish

Great Northern at Butte, Mont., in 1920. He was appoined general car foreman at that point in 1941; car foreman at Havre in 1943; car foreman at Hillyard, Wash., in 1945, and general car foreman at Spokane, Wash., in 1946. He was transferred to St. Paul in 1948 as general car foreman.

FRED CEBULLA, master car builder of the Great Northern at St. Paul, Minn., has retired after 53 years of service with that road.

Mr. Cebulla, a native of Gleiwitz, Silesia, Germany, entered the service of the G. N. as a laborer, serving for five years at various points before becoming carman at Havre, Mont., in 1902. He was later assistant car foreman and car foreman at Havre until 1908, when he was transferred to Superior, Wis., as repair track foreman. He became car foreman at Great Falls, Mont., in 1910, and returned to Superior as repair track foreman in 1912. From 1918 to 1928, he was assistant superintendent of the G. N.'s car shops at St. Cloud, Minn. He subsequently became superintendent, and in 1937 was transferred to St. Paul as general car foreman. He was appointed master car builder in 1946.

JOHN M. HICK, assistant to the master car builder of the Great Northern at Spokane, Wash., has been appointed general car foreman at Spokane.

CHARLES ROSS has been appointed general passenger-car inspector of the Chesapeake & Ohio, with headquarters at Huntington, W. Va.

Master Mechanics And Road Foremen

W. S. C. BURWELL has been appointed master mechanic of the Cincinnati division of the Chesapeake & Ohio, with headquarters at Stevens, Ky.

G. W. LUSHBAUGH, general foreman of the Chesapeake & Ohio, has been appointed master mechanic, Clifton Forge division, with headquarters at Stevens, Ky.

W. H. BRUENING, assistant superintendent Diesel equipment of the Kansas City Southern, at Pittsburg, Kan., has been appointed master mechanic at Shreveport, La., with jurisdiction over the Southern division of the K. C. S. and the entire line of the Louisiana & Arkansas (part of the K. C. S. Lines).

Shop and Enginehouse

C. M. DOCKSTADER, superintendent of shops and equipment of the Chicago, Aurora & Elgin, at Wheaton, Ill., has retired after 20 years of service with that road. Mr. Dockstader was born in Canada in 1869, and in 1895 went to Chicago, where he became employed in the electrical-mechanical department of the Chicago Elevated. From 1914 to 1929 he was inspector of construction of new passenger equipment for several electrically operated rail lines in the Chicago area, including the Chicago North Shore & Milwaukee, the Chicago South Shore & South Bend, the Chicago Rapid Transit and the C. A. & E. Mr. Dockstader was placed in charge of the Wheaton shops of the C. A. & E. in 1930.

R. W. TONNING, electrical engineer of the Atlantic Coast Line at Wilmington, N. C., has been appointed acting shop superintendent at Rocky Mount, N. C.

VICTOR A. TETU, superintendent of the Jackson street shops of the Great Northern at St. Paul, Minn., has retired.

JAMES SUMMERS, general foreman at the Jackson street shops of the Great Northern at St. Paul, Minn., since 1945, has been appointed superintendent of the shops.

NEW DEVICES

(Continued)

Vapor Degreaser

A large capacity vapor-spray degreaser has just been announced by Circo Products Company, Cleveland, Ohio. This new model, called the C-120, was designed for the transportation field and heavy industrial use. It has a vapor depth of 84 in.,

inside length of 96 in., and width of 60 in. It is available in either nickel-clad, stainless-clad or zinc-sprayed construction. Its nonflammable, non-explosive solvent is heated by steam, gas or electricity. The heat input assures a cleaning capacity of 18,000 lb. per hour. An outside water jacket and inside water coils give double protection against vapor loss. The control is fully automatic.

Rust Inhibiting Oil Base Paint

A rust inhibiting oil base paint has been added to the line of maintenance products offered by United Laboratories, Inc., Cleveland, Ohio. It is known as Certified Rust Inhibitor No. 425.

Its penetrating quality prevents rust from spreading and provides an excellent finish coat. By its penetrating action, moisture beneath the surface is expelled almost as rapidly as the coating is applied. It may be applied over new metal to prevent corrosion as well as metal already covered entirely or partially with rust. It is resistant to chemical fumes and salt air and will withstand temperatures of minus 100 deg. F. to plus 500 deg. F.

The product will serve both as a primer and finish coat in one application. It may be applied directly over damp surfaces as well as dry.

The rust inhibitor is easily applied by either brush or spray. Its fine coverage of 700 to 1,200 sq. ft. per gal. makes it economical, as one coat is usually sufficient, serving as both primer and finish coat. It is only necessary to remove loose or scaling rust prior to application. It dries in 4 to 12 hours depending on temperature and humidity.

This paint is available in clear, black, white, dark red, tile red, dark green, gray and aluminum.